# THIRTY-SECOND ANNUAL REPORT

For Calendar Year 1942

Northern Rocky Mountain Forest and Range Experiment Station
U. S. Department of Agriculture
Forest Service

Missoula, Montana

M. Bradner, Director

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Supplemental Memorandum

## INTRODUCTION

On January 1, 1942 the research organization in the Northern Rocky Mountain region embarked for a second time in its history on a new year's program with the nation at war. The events at Pearl Harbor in December 1941 and the following declarations of war against the Axis powers changed the completion of effort from one of defense to one of all-out participation in the war effort. Even as the annual report for the calendar year 1941 was being written, considerable thought was being given to a reorientation of the station's program in the light of the war situation.

It was evident early in 1941 that wood products, beef and mutton, leather and wool were highly essential to the war effort. Now in addition to the nation being the arsenal of democracy and the bread basket of the world, our troops were going to have to be equipped, transported, and fed on many far-flung war fronts. Products of the forest and the range became more and more important to the world at war. As other basic metals and materials became increasingly scarce, wood became not only an essential but a critical item in this effort. The Forest Service, being manager and protector of much of the forest and range resource, was in an enviable position to help in the war effort. The Branch of Research was in even better position to help because it had for many years been solely responsible for forest and range research and investigation and had available much of the basic information on these resources and knew the situation

and the problems in their management and use.

The Branch of Research outlined early in February 1942 the policy that was to be followed in reorienting the research program to wartime needs. Station programs were to be redirected insofar as possible to tie directly to war or immediate post-war effort without unreasonable sacrifice of valuable work under way and past investments in time and money. Highest priority was to be given to those projects capable of furnishing assistance to the armed services or indirect assistance through helping industries or agencies that were directly aiding the armed forces, including particularly the production of food, fibre, and wood products. Publications containing information of particular value in the war effort were to be given especially high priority. Projects nearing completion were to be completed. Technical extension work based on specialized knowledge and past research experience was given emphasis in the redirected program. Station members were to hold themselves in readiness to take on pressing jobs calling for information not readily available on short notice. Projects of low priority in relation to wartime activities were to be placed on a maintenance basis or discontinued for the duration.

On the basis of the above clear-cut policy the program of work at the Northern Rocky Mountain Forest and Range Experiment Station was critically reviewed and redirected to make it as effective as possible in the war effort. Some projects and studies were discontinued for the duration. These included certain minor studies in

silvics, protection and range investigations. Others were placed on a maintenance basis with only the most essential work continued to insure against unreasonable losses due to past investments in time and money. Included in these projects were the many permanent sample plots established to study methods of cutting, growth and yield, and stand improvement practices in silviculture, and growth and yield and utilization in forage investigations. Still other projects of somewhat higher priority were classified as of value to the immediate post-war effort and continued with reduced funds and personnel. These included range reseeding and forest stand improvement studies. Grazing management investigations, timber harvesting and conversion studies, new uses and new forms of use for forest products, forest products statistics, the forest survey, and certain phases of our fire research and forest management program were classified as of A-1 priority in the war effort. Work on these projects was speeded up, technical extension work was encouraged, and a concerted effort was made to compile, analyze, interpret, and release in the form of timely articles, information to help guide and direct the nation's effort during this critical war period.

Before the end of the fiscal year(June 30,1942) the station had effectively fitted its work, personnel, and funds into the redirected wartime program. A number of new activities had also been initiated. As early as February 1942 the need for wood products had become so critical that up-to-the-minute reports on the requirements for and production of certain forest products were being called for by the War Production Board. These reports were known as "quickies"

in the field and called for quick action on the part of the organization. Later on, in order to anticipate for and meet the ever increasing demand for such information by the War Production Board, the whole series of such reports, studies and surveys were set up under the R(V) Products Supplies Surveys program and authorized and financed under a cooperative agreement between the Forest Service and the WPB.

Earlier in the year Director Bradner was appointed to act for Regional Forester E. W. Kelley as chairman of the subcommittee on Wildlands for the Pacific Northwest Regional Committee on Post-war Planning. Considerable work was done on this project particularly on state plans for land resource conservation and development. In May 1942 the station was asked to cooperate with the Region in the planting of some 30 acres of rubber-producing Russian dandelion (Kok-saghyz) for seed production. Sixty-two acres were eventually planted in three different localities within the State of Montana. Mr. Hurtt, Chief of the Division of Range Research, was designated as the station representative to work with the Region. Hurtt, Merrick, and Friedrich spent considerable time in assisting the Region in pretreating the seed, making germination tests, and in fertilizer, root-sprouting, and other short-term studies, and by other activities needed to place the project on a sound cultural basis. At Miles City, Woolfolk of the station, handled all phases of the planting, culture, and harvesting on 10 acres of Kok-saghyz planted there. The plantings were considered to be successful

particularly from the seed production standpoint. Most of the plants at Missoula were eventually dug and the roots shipped to the Philadelphia laboratory for an analysis of rubber content.

During the last half of 1942 (first half of fiscal year 1943) consistent progress was made on all phases of the wartime program, despite a cut of 14.3 percent in funds and a 30 percent loss in regular personnel over and above replacements and additions. The decrease in funds was heaviest in the Forest Survey (-28.6 percent) and Forest Products (-17.4 percent) allotments, the two major lines of research work considered of highest priority among the wartime activities. Of the 21 losses in personnel, 8 were due to military furloughs, 8 to transfers to other stations, regions, and projects, 2 to furloughs for lack of funds, and 3 to resignations to enter industry. Most of the 10 replacements and additions came from the administrative branch of the Service.

The station is particularly proud of its members in the armed services. Ten of its regular personnel have joined the Army, Navy, and WAAC to date. Several more of its one-time temporary personnel are also in the Army and Navy.

The trained technical personnel within the organization were able to furnish war agencies with much sound and valuable advice and guidance based on past research experience and specialized technical knowledge. Mr. Gisborne did a fine piece of work in his inspection of Army camps, depots, and airfields and his recommended plans for their protection from fire. Hurtt's and his men's thorough understanding of the sound production of livestock as related to

## Losses and Replacements in Station Personnel During 1942

| Division | Station Personnel as of January 5, 1942 | | Reduction | Cause[1] T - Transfer R - Resigned F - Furloughed MF - Military Fur. | Number Replacements & Additions | Station Personnel as of January 5, 1943 | |
|---|---|---|---|---|---|---|---|
| | Position | No. | Number | | | Position | No. |
| Overhead | Director | 1 | - | - | - | Director | 1 |
| | Jr. Adm. Asst. | 1 | 1 | 1-MF | - | - | - |
| | Clerk-Steno. | 2 | 2 | 1-MF, 1-R | 1 | Clerk-Steno. | 1 |
| | Total | 4 | 3 | 2-MF, 1-R | 1 | Total | 2 |
| Silviculture | Division Chief | 1 | 1 | 1-MF | [2] | - | [2] |
| | Asst. Proj. Leader | 1 | 1 | 1-F | - | - | - |
| | Supt. Exp. Forest | 1 | 1 | 1-R | 1 | Winter caretaker | 1 |
| | Technical Asst. | - | - | - | 1 | Technical Asst. | 1 |
| | Total | 3 | 3 | 1-MF, 1-F, 1-R | 2 | Total | 2[3] |
| Fire | Division Chief | 1 | - | - | - | Division Chief[2] | 1 |
| | Project Leader | 1 | 1 | 1-T | - | - | - |
| | Project Leader | 1 | - | - | - | Project Worker[3] | 1[3] |
| | Supt. Exp. Forest | 1 | - | - | - | Supt. Exp. Forest | 1 |
| | Clerk-Statistician | - | - | - | 1 | Clerk-Statistician[4] | 1[4] |
| | Total | 4 | 1 | 1-T | 1 | Total | 4 |
| Forest Products | Division Chief | - | - | - | - | - | [5] |
| | Project Leader | 1 | - | - | - | Acting Division Chief | 1 |
| | Clerk-Statistician | 1 | 1 | 1-T | - | - | [6] |
| | Technical Asst. | - | - | - | 1 | Technical Asst. | 1 |
| | Total | 2 | 1 | 1-T | 1 | Total | 2 |
| Range | Division Chief | 1 | - | - | - | Division Chief | 1 |
| | Project Leader | 2 | 1 | 1-MF | 1 | Project Leader | 2 |
| | Asst. Proj. Leader | 3 | 2 | 1-R, 1-T | 1 | Asst. Proj. Leader | 2 |
| | Supt. Exp. Range | 1 | - | - | - | Supt. Exp. Range | 1 |
| | Technical Asst. | 2 | 1 | 1-F | 1 | Technical Asst. | 2[7] |
| | Clerk-Steno. | 1 | - | - | - | Clerk-Steno. | 1 |
| | Total | 10 | 4 | 1-MF,1-F,1-T,1-R | 3 | Total | 9 |
| Forest Survey | Division Chief | 1 | 1 | 1-T | - | Division Chief | - |
| | Project Chief | 1 | - | - | - | Acting Division Chief | 1 |
| | Project Leader | 2 | 1 | 1-T | - | Project Leader | 1 |
| | Asst. Proj. Leader | - | - | - | 1 | Asst. Proj. Leader | 1 |
| | Field Assistant | 4 | 4 | 2-MF, 2-T | - | - | - |
| | Statistical Clerk | 4 | 3 | 2-MF, 1-T | 1 | Statistical Clerk | 2 |
| | Draftsmen | 1 | - | - | - | Draftsmen | 1 |
| | Clerk-Steno. | 1 | - | - | - | Clerk-Steno. | 1[6] |
| | Total | 14 | 9 | 4-MF, 5-T | 2 | Total | 7 |
| Station Total | | 37 | 21 | 8-MF,8-T,2-F,3-R | 10 | Total | 26 |

Station personnel has been reduced 30 percent.

1/ Furloughed (F) means for lack of funds or completion of work.
2/ Gisborne placed in charge of Forest Management (Silviculture and Fire) for duration.
3/ Stickel assigned to Silviculture.
4/ Handles clerical work for both Silviculture and Fire.
5/ Bradner acts as Division Chief.
6/ Handles clerical and some statistical work for Forest Products.
7/ One of these technical assistants attends University in winter and works on hourly basis.

range lands has been of much value in helping to guide the achievement of present goals and the sound consideration of potential capacities and future requirements. The huge fund of basic information on the volume, size, quality, and accessibility of the commercial forest species and products within the region and the detailed and long-kept records on the production, requirements, costs, prices, and mill and plant capacities for forest products made available by the Divisions of Forest Survey and Forest Products at the station have been of immeasurable help in meeting the many wartime requests for such data.

Station plans for 1943 contemplate a concerted attack on all phases of the research program as now oriented to meet wartime needs. Technical information will be kept current and up-to-date if at all possible with present funds and personnel. Short-term studies and surveys will be undertaken to fill gaps in information urgently needed by war agencies. The essential maintenance work will be done. Technical extension through advice and guidance will be again stressed.

A brief resume of the accomplishments and results for 1942 and the plans for 1943 by divisions follows:

## RANGE RESEARCH

Range research work has made substantial progress under reorientation of effort to stress wartime contributions despite some reductions and shifting of range personnel. Lemon transferred to the Appalachian Station, Horem went into defense work, and Merrick

was called to military service during the past year. Friedrich and Pool filled two of these vacancies. Only urgent work was continued, but the new Kok-saghyz project took the place of some curtailment of regular range work. Artificial revegetation, as well as management research at Vigilante, is largely on a maintenance basis, but advantage was taken of opportunities for progress on certain studies that could be handled largely on an incidental basis with resources available.

## I. ACCOMPLISHMENTS AND RESULTS - 1942

### A. Range Research Projects:

#### 1. Management

Management work has provided usable results in a program of maximum sustained wartime production with an effort made to avoid serious gaps in and to maintain a basic foundation of current research data. The sheep range project at the U.S. Range Livestock Experiment Station is being closed and results rounded up for publication. Minimum records are being maintained on the cattle project there and on both cattle and sheep ranges at Vigilante.

a. Cattle Range Phase:

Quadrat chartings of early 1942 showed continuation of the upward trend in density of short-grass range vegetation which started in 1937 at the close of the drought period. The total density last spring was 88 percent of the 1933 level, which is approximately 9 times greater than in 1937. This upward trend probably continued through late 1942 because of the generally favorable season.

The apparent vigor and condition of cactus started to decline

by early 1940, due to insects, competition and increased precipitation. Fortunately, the surface occupied last season on special plots, established to follow trends of this problem species, was nearly down to the 1937 level. The tremendous and lasting impact of severe drought on short-grass ranges is indicated by these trends of cactus and other vegetation.

The increasing density of total forage cover was supported by good height growth that resulted in the best forage crop since drought years. This situation was reflected by very satisfactory cow and calf weights. At weaning time, calves averaged 422.8, 415.9 and 427.1 pounds respectively, for heavily, moderately and lightly stocked experimental pastures. The calves from the heavily grazed range exceeded any previous total or average weight for that lot and for the first time in 9 years these calves averaged heavier than those from the moderately grazed lot. However, for these nine seasons, weaning calves have averaged 335.0, 364.3 and 367.7 pounds, respectively, for the heavily, moderately and lightly grazed experimental range pastures and the calf crop has averaged 79.4, 84.4 and 83.3 percent.

Total weaning calf weight prorated to all cows of each grazing intensity over the 9-year period has averaged 266.1, 307.7 and 306.4 pounds, respectively, which shows a penalty of 40 pounds or more per cow yearly for heavy grazing, wholly aside from various other penalties also due to the same cause. It is noteworthy that the calves from heavily grazed pastures averaged slightly heavier

during one very favorable year only. This is of minor import when posed against the consistently greater meat production, lower unit costs for all feed, and reduced risks over the years from moderately and lightly stocked ranges. Such an occasional good season helps to explain how the fallacy originated, that heavy stocking was the most profitable and productive range practice. Results for 9 years, to prove this is a fallacy, are most convincing from the standpoint of cattle economics. However, because density on quadrats of the heavily grazed cattle pastures has improved from the drought at approximately the same rate (actually a little faster for heavily than lightly grazed pastures) as for the more conservatively grazed pastures, due to five unusually favorable seasons in succession, the experiment may not properly be discontinued now.

The final and complete effects of three degrees of stocking or grazing can only be determined after the forage on heavily grazed range declines significantly below the level of the more conservatively used range. Only then will we have an objective basis for permanent utilization standards for such range. As range managers, our first concern must be for the permanent welfare of the range rather than for immediate profit to the producer. We now have from this project the partial story of how production profits are currently reduced but not what happens to the range itself under continual heavy use or the ultimate economics of the situation when the range does fail. We now do have the detailed productive history of this range, starting in good condition over a 10-year period - both in meat and in forage production during extreme drought and in five very

favorable seasons thereafter. Few, if any, ranges in the West have such a detailed production history available. It would be short-sighted, indeed, to discontinue this project and lose the cumulative data and lessons that can be fully developed only if the project is continued until the range deteriorates clearly under heavy use and with a normal alternation of dry, normal and drought years.

b. Sheep Range Phase:

That this short-grass range does deteriorate under heavy grazing by sheep is demonstrated by a depletion survey and by several hundred clipped samples from heavily grazed and damaged as compared to adjacent undamaged areas in the experimental sheep pastures. These pastures had been grazed 6 years, 1936-1941, inclusive, but not in 1942.

According to these clippings, the total production of all vegetation, except cactus on zone of overgrazed and damaged range, was at the rate of 1,480 pounds per acre when clipped to a 1-centimeter stubble as compared to 1,250 pounds per acre on adjacent zones classed as undamaged areas. However, on the damaged range 44.6 percent or 660 pounds of the total was made up of annuals of low value and only 820 pounds of perennial grasses and weeds of relative high value. On the undamaged plots, the annuals made up only 11.2 percent or 140 pounds and valuable perennial forage plants made up 1,110 pounds per acre.

Density of heavily grazed and damaged range was substantially reduced as compared to undamaged areas. This seems to emphasize the fact that the damage done by 6 years of heavy grazing will persist for a long time beyond the 1 year of protection enjoyed during 1942.

REDIRECTION OF STATION'S RESEARCH PROGRAM TO MEET WAR TIME NEEDS - ACCOMPLISHMENTS 1942, PLANS FOR 1943

| Work Project | Line Projects on Station Program end of calendar year 1941 | Status of projects, 1941 | Redirection of Research to War-time Activities as recommended by W. O. Div. Research to Bureau of Budget April 1942 | Recommendations made by NRM Station (in answer to Forsling's letter of February 25, 1942 on Redirection of Research Program to War-time Activities) | Branch of Research's Approval or Disapproval of Station Recommendations of Redirection of Research Program (Forsling's Report, Station's Annual of July 2, 1942) |
|---|---|---|---|---|---|
| **FOREST MANAGEMENT RESEARCH** | | | | | |
| Silviculture | Harvest Cuttings (W.P.) | Active-field and office | War 50%<br>Post-War 12<br>Maintenance 38<br>100% | Classed as A-3: Maintenance project with No. 1 priority in Silviculture. Recommended continuation study on partial cutting in white pine and empirical studies of cutting methods in E. spruce. Recommended keeping Deception Creek open for timber sales and maintenance work. Recommended compilation of report on development of natural reproduction in white pine. Recommended maintenance of all necessary plot examination work. | Disapproved continuation of partial cutting in white pine studies, work under way to be placed on maintenance basis. Approved short time study of cutting of E. spruce as a technical guidance project. Approved maintenance of all necessary work. Recommended summarization of what we know of value to war and post-war programs. |
| | Stand Improvement (W.P.)<br>Stand Improvement (P.P.) | Active-field and office<br>Active-office only | | Classed as A-2: Post-war projects with No. 2 priority in Silviculture. Recommended examination essential plots. Interpretation of data and assembling results as they become available as guides for stand improvement work in post-war period. | Station recommendations approved. |
| | Silvics - Phenology | Inactive | | Classed as A-4: Non-urgent and discontinued for duration. | Station recommendations approved. |
| Mensuration | Stand Studies (W.P.) | Active-remeasured 6 plots. | War 62%<br>Post-War 0<br>Maintenance 38<br>100% | Classed as A-3: Maintenance with No. 4 priority in Silviculture. Recommended measurement of permanent sample plots at 10-year intervals instead of 5 year. | Station recommendation approved. |
| | Stand Studies (P.P.) | Inactive | | | |
| | Stand Studies (L-D.F.) | Active-remeasured 2 plots. | | Classed as A-4: Non-urgent and discontinued for duration | Station recommendation approved. |
| Regeneration | Planting and Direct Tree Seeding | Active-field and office | War 33%<br>Post- War 47<br>Maintenance 20<br>100% | Classed as A-2: Post-war project with No. 3 priority in Silviculture. Recommended examination of direct seeding plots under way, interpretation of data and publication results. | Station recommendation approved. |
| Genetics | Racial Variations (P.P.) | Inactive | War 38%<br>Post-War 0<br>Maintenance 62<br>100% | Classed as A-4: Non-urgent project and discontinued for duration. | Station recommendation approved. |
| Fire Protection | Behavior | Active-field and office | War 78%<br>Post-War 0<br>Maintenance 22<br>100% | Classed "Danger Measurement" and "Altitude and Aspect" phases as A-1: war projects with No. 1 priority in Fire Research. Recommended continuance Gisborne to prepare new Burning Index Meter. Phase dealing with Effect of Timber Canopy discontinued in field. Progress report to be prepared. | Approved. Immediate development and improvement of fire danger and dispatcher meters taking into consideration available information on effect of altitude and aspect and then furnish the technical guidance necessary to see that new and past research results are fully used. Minimize long-time features of the altitude and aspect study and confine additional work to such parts as can be of immediate use in improving meters. |
| | Control | Active-field and office | | Classed "Revision of Hornby's Fire Control Planning Practices" as A-1: war project. Classed the preparation of a "Fuel Reduction Handbook" by Gisborne as A-2 post-war project. Recommended dropping "Rate of Spread" and "Resistance to Control" phases for duration. | Approved early revision of Hornby's fire control practices if man power available. Also short-time studies on rate-of-line preparation, methods of fireproofing danger zones or other fire control problems of immediate value. Approved preparation of fuel reduction handbook as post-war project. |
| | Economics | New - no work 1941 | | Classed as A-2: Post-war project. Proposed 1 month of Gisborne's time. | Disapproved work on this project. |
| **RANGE INVESTIGATIONS** | | | | | |
| Grazing Management | Management-Short Grass Ranges (Sheep) | Active-field and office | War 80%<br>Post-War 10<br>Maintenance 10<br>100% | Classed as A-1: War project with No. 1 priority in Range Division. Recommended continuation of cattle phase of project in full until 1945 or 1946. Recommended closing certain phases of sheep project in 1942. Grazing of sheep pasture by sheep already terminated. | Questioned continuation of present cattle phase of study past 1942. Recommended critical analysis of results to date and efforts 1942 to plug any holes that may be found in essential data. Approved only the essential minimum information necessary to clinch results and to connect work being terminated with that which may be undertaken after the emergency. No particular comments on sheep phase of study at Miles City except discontinuance of usual field work (sheep grazing). |
| | Management-Short Grass Ranges (Cattle) | Active-field and office | | | |
| | Methods & Procedures for Measuring Forage | Active-field and office | | Classed as A-4: Non-urgent. Only incidental work that can be done without interference with A-1 and A-2 projects will be considered. | No comment. Recommendations probably approved. |
| | Management-Short Grass Ranges, Utilization Standards | Active-field | | Classed as A-4: Non-urgent project. Results to date on the range utilization survey method appear to warrant one or two journal articles. | No comment. Recommendations probably approved. |
| | Management - Summer Ranges | Active-field and office | | Classed as A-3: Maintenance project. Recommended continuance of recording data from "proper date for spring grazing," "degree of clipping," and "trends of forage cover under prevailing degree of use" plots already established. | Recommended that studies at Vigilante be placed on limited observation basis only. Recommended "clipping" phase be terminated. |
| Artificial Revegetation | Methods | Active-field and office | War 70%<br>Post-War 20<br>Maintenance 10<br>100% | Classed as A-2: Post-war project with No. 2 priority in Range Division. Additional research needed to provide more specific guidance in reseeding the better plowed and otherwise depleted lands now covered with thick stands of low-value forage. Inspection of seedings already made to add to knowledge of methods used. | Station knowledge of artificial revegetation should aid materially in action and plans for reseeding by any agency, stockmen or others. Arrange for effective observations or empirical tests relating to grazing of established stands. Prepare and release short articles based on unpublished results in files. |
| | Site Factors | Active-field and office | | Classed as A-4: Non-urgent project. Work discontinued for duration except whatever incidental work proves possible in connection with other project. | No comment. Recommendation probably approved. |
| | Species Adaptability | Active-field and office | | Classed as A-2: Post-war project with No. 2 priority in Range Division. Additional research needed to record and analyze results from experiments already installed for the more promising species and mixtures. Work on this phase combined with Methods phase. | Recommended that plans for tests of large numbers of plants that might be suitable be held up. This applies to all nurseries. Range tests might well be pushed of known especially promising species tested only limitedly to date. Publication of releases of value during war emergency. |

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REPORTS
Station's Annual

REDIRECTION OF STATION'S RESEARCH PROGRAM TO MEET WAR TIME NEEDS - ACCOMPLISHMENTS 1942, PLANS FOR 1943

| Work Project | Line Projects on Station Program End of Calendar Year 1941 | Accomplishments 1942 | Plans for 1943 |
|---|---|---|---|
| | | **FOREST MANAGEMENT RESEARCH** | |
| Silviculture | Harvest Cuttings (W.P.) | Placed work on maintenance basis. Finished laying out two partial cutting plots under way when order came to discontinue study for duration. Examined (measured) 33 permanent harvest cutting plots. Issued two preliminary progress reports. Maintained improvements at Deception Creek Station. Carried on timber sales work. | Sixteen permanent sample plots to be examined and measured. Plot records compiled and progress reports prepared. Place Deception Creek Station under caretaker. Continue timber sales under Forest Supervisor administration. |
| | Stand Improvement (W.P.)<br>Stand Improvement (P.P.) | Examined and measured nine permanent stand improvement plots. Prepared one progress report on pruning. | Thirty-five plots to be examined and measured, including one which was on docket for 1942. Compile plot records and prepare progress reports. |
| | Silvics - Phenology | No work done. | No work planned. |
| Mensuration | Stand Studies (W.P.)<br>Stand Studies (P.P.)<br>Stand Studies (L-D.F.) | Examined and measured 16 permanent sample plots. Plot records being compiled. | Eleven permanent sample plots to be examined and measured. Compile plot data and prepare progress reports. |
| Regeneration | Planting and Direct Tree Seeding | Further studies discontinued for duration. Due to shortage of man power and weather conditions examined only 1 out of 23 plots. | Examine and measure 35 sample plots (including 22 left over from 1942). Compile plot records and prepare progress report. |
| Genetics | Racial Variations (P.P.) | No work planned. Project discontinued for duration. | No work planned. |
| Fire Protection | Behavior | A new Behavior Meter was originated and issued for field trial. A majority of the Supervisors recommended official adoption for use in 1943. All work on the Altitude and Aspect study and on the Forest Crown Atmosphere study completely dropped. | Give technical advice to Forests and Region, National Parks, and Indian Service in use of new meters to guide fire control action. Stickel to complete summary of 30-year weather records for Priest River. |
| | Control | To relate fire behavior directly to fire control organization needs a new Fire Danger Meter was prepared and issued for field trial. This utilizes the 100-point scale recommended for national use. Historical article prepared covering "Mileposts of Progress in Fire Control." | Preliminary outline for revising Hornby's "Fire Control Planning Practices" to be prepared. Fuel Reduction Manual to be written and published. |
| | Economics | No work done. | No work planned. |
| | | **RANGE INVESTIGATIONS** | |
| Grazing Management | Management-Short Grass Ranges (Sheep)<br>Management-Short Grass Ranges (Cattle) | Total range vegetation continued to increase from low point reached in 1937 but not yet back to predrought level. Cactus has declined for 2 years. Good forage crop resulted in heavy weaning calves. Calves for 9 years average 335.0, 364.3, and 367.7 pounds at weaning on heavily, moderately, and lightly stocked ranges. Upward trend of vegetation about same on each. Depletion survey on sheep range showed severe damage on areas grazed heavily for 6 years reflected by reduced density and volume of best forage. | Continue study until heavily grazed range deteriorates significantly so that ultimate ecological and economic effects may be determined in addition to current effects. Only current effects now known. Round up, analyze, and prepare departmental publication on sheep range phase. |
| | Methods & Procedures for Measuring Forage | Dormant except for incidental improvements in utilization surveys and other procedures. | Dormant as a project. |
| | Management-Short Grass Ranges, Utilization Standards | Accumulated additional basic data on measuring utilization and on what is proper utilization with vegetation and livestock production both considered. | Continue analysis of data to yield sound utilization standards. |
| | Management - Summer Ranges | Evidence indicates that both cattle and sheep range at Vigilante could be grazed earlier and heavier with little risk but with greater production. Preliminary utilization standard has been developed. | Set up empirical study to determine effects of heavier use on sheep and cattle. Refine preliminary utilization standards. |
| Artificial Revegetation | Methods | Spring and fall installations made to find cheap, rapid method for reseeding large areas of cheatgrass. Unfavorable weather at critical time last spring gave poor survival. | Maintain records. Try rye or sorghum crop as pretreatment on cheatgrass areas. Graze or mow rye this summer before it seeds |
| | Site Factors | Largely dormant. High altitude nursery established at 9000 feet. | Dormant except incidental records. |
| | Species Adaptability | Largely on a maintenance basis. Grazing trial on crested wheatgrass gave nearly three times more gain per acre for yearlings and required about one-third the acreage of native range. | Will maintain records and renew three range adaptation tests. |

REDIRECTION OF STATION'S RESEARCH PROGRAM TO MEET WAR TIME NEEDS - ACCOMPLISHMENTS 1942. PLANS FOR 1943

| Work Project | Line Projects on Station Program end of calendar year 1941 | Status of projects 1941 | Redirection of Research to War-time Activities as recommended by W.O. Div. Research to Bureau of Budget April 1942 | Recommendations made by NRM Station (in answer to Foraling's letter of February 25, 1942 on Redirection of Research Program to War-time Activities) | Branch of Research's Approval or Disapproval of Station Recommendations of Redirection of Research Program (Foraling's Report, Station's Annual of July 2, 1942) |
|---|---|---|---|---|---|
| **FOREST ECONOMICS - FOREST SURVEY** | | | | | |
| Forest Survey | Inventory Phase | Active-field and office | War 95%<br>Post-War 5<br>Maintenance 0<br>100% | Classed as A-1: War project with completion of work west of Continental Divide of first priority in Division. Recommended completion field inventory and office compilation of data for Western Montana township and unit type maps. Recommended also field inventory with WPA funds in Eastern Montana. Also office compilation and map production of areas completed. Recommended preparation and printing of a lithographed type map of the Inland Empire region. | Recommendations approved. Focus work more directly on war needs (volume, size, quality, and availability of commercial species). Plan so that men can be ready to take on pressing jobs assigned by Washington office. |
| | Growth and Yield Phase | Active-field and office | | Classed as A-1: War project with No. 3 priority in Division. Recommended calculation of growth and yield data for Western Montana counties. | Recommendations approved. |
| | Depletion Phase | Active-field and office | | Classed as A-3: Maintenance project. Depletion phase completed for Inland Empire region. Depletion data will be included in "Keeping Findings Current." | Recommendations approved. |
| | Requirements Phase | Active-field and office | | Classed as A-3: Maintenance project. Requirements phase completed for Inland Empire region. Data must be kept current to reflect impact of war. | Recommendations approved. |
| | Interpretation of Data | Active-office only | | Classed as A-1: War project for Western Montana and A-2 Post-war for remainder of region. Rated as of No. 2 priority in Division. Statistical data to be made available for all Western Montana counties. Completed reports on Ravalli County and Western Montana unit. | Recommendations approved. See below under "Keeping Findings Current." |
| | Keeping Findings Current | Active-office only | | Classed as A-2: Post-war project and rated fourth priority in Division. Recommended that four to six counties in North Idaho be brought up to date during 2-year period. | Comment: This plan (see above opposite Inventory Phase) does not write down the importance of keeping the survey current or of interpreting the data to give direction to forest policies and programs, but merely changes the timing and emphasis on the different phases of the work. Recommends bringing volume figures for Benewah and Kootenai Counties, Idaho, up to date. |
| **FOREST PRODUCTS RESEARCH** | | | | | |
| Timber Harvesting and Conversion | Logging-Milling Studies | Active-office only | War 100%<br>Post-War 0<br>Maintenance 0<br>100% | Classed as A-1: War project. Rated as third priority in Division. Much information already available. Need to keep abreast of changes in methods, equipment, utilization standards and character of products caused by impact of war and establishment of wood as a critical war material. | Recommendations approved. Will not fill vacancy created by Rapraeger's resignation. Allotment cut from $12,100 to $10,000. |
| | Properties & Uses - Little-Used Species | Active-field and office | | Classed as A-1: War project and rated of first priority in Division. Recommended speeding up work on this project to meet war needs. Need studies to determine possibility of pulp production in region, spruce for aero stock, larch for veneer and plywood, secondary species for wood containers and Douglas-fir bark for cork. Investigate all places where wood can replace metal and other critical materials for war use. | Recommendations approved. See above. |
| Forest Products Statistics | Manufacturing Cost Statistics | Active-field and office | War 100%<br>Post-War 0<br>Maintenance 0<br>100% | Classed as A-1: War project and rated first priority in Division. Recommended speeding up and enlarging scope of these studies to make latest figures on cost of production, prices and amounts produced available monthly if necessary. Need to keep currently abreast of requirements, specifications, factors affecting production, lumber production problems, ceiling prices, bottlenecks, etc. | Recommendations approved. See above. |
| | Production Statistics | Active-field and office | | | |
| | Selling Price Statistics | Active-field and office | | | |
| Wood Preservation | Service Test Records | Active - 11 inspections | War 92%<br>Post-War 0<br>Maintenance 8<br>100% | Classed as A-3: Maintenance project and rated fourth priority in Division. Recommended inspection of 3 railroad tie test tracks, 2 fence post tests and 1 telephone line. No new installations or experiments to be initiated. Keep up progress reports. | Recommendations approved. |

REDIRECTION OF STATION'S RESEARCH PROGRAM TO MEET WAR TIME NEEDS - ACCOMPLISHMENTS 1942, PLANS FOR 1943

| Work Project | Line Projects on Station Program End of Calendar Year 1941 | Accomplishments 1942 | Plans for 1943 |
|---|---|---|---|
| **FOREST ECONOMICS - FOREST SURVEY** | | | |
| Forest Survey | Inventory Phase | Initial inventory data now completed for entire Inland Empire region and Chouteau and Fergus Counties in Eastern Montana. This comprises 40 million acres gross area. Cover type maps available total 39 million acres on 2-inch scale and 32 million acres on 1-inch scale. Basic statistics for Western Montana are summarized. During year 2 million gross acres was mapped in E. Montana. Area and volume computations covered 2.4 million acres of forest land & 8.5 million acres gross. | Complete area and volume compilations for Eastern Montana area inventoried. Prepare cover type maps for all area mapped to date. Prepare cover type map for Inland Empire region to be lithographed. Recommend completion of field inventory in Lewis and Clark County, part of which is on east side of Divide. |
| | Growth and Yield Phase | Growth data completed for entire Inland Empire region and for Chouteau and Fergus Counties in Eastern Montana. | Compile growth data for Judith Basin County, Mont. Keep growth data up to date for Inland Empire region. |
| | Depletion Phase | Detailed fire drain summaries for period 1931-37 are now available for all counties in Inland Empire, and cutting drain for entire Northern Rocky Mountain region. | Keep fire and cutting drain figures current. |
| | Requirements Phase | Local requirements data completed for Northern Rocky Mountain region. Checks made on requirements due to war emergency. | Keep requirements data current. Much of this work done in cooperation with Division of Forest Products. |
| | Interpretation of Data | A detailed report was released during year on "The Forest Situation in Lincoln County." Statistical releases were issued for six Western Montana counties - Missoula, Lewis & Clark, Deerlodge, Silver Bow, Powell, and Granite. Work started on preparation Western Montana Unit Report and Ravalli (Montana) County detailed report. | Statistical releases for Fergus and Chouteau Counties (Eastern Montana) ready for mimeographing and will be released. Prepare and release statistical report for Judith Basin County. Complete the Ravalli County report and perhaps the comprehensive report on Forest Situation in Western Montana. |
| | Keeping Findings Current | No field work done other than collection of up-to-date status of ownership records for Benewah and Kootenai Counties, Idaho. Data on area burned and logged are collected regularly from state, protective agencies, and Indian Service sources. | Resurvey Benewah and Kootenai Counties, Idaho. Continue to collect current data on fire and cutting drain. |
| **FOREST PRODUCTS RESEARCH** | | | |
| Timber Harvesting and Conversion | Logging-Milling Studies | No new studies undertaken. Compiled, analyzed, and prepared progress report on conversion value of lumber from partial cuttings in white pine. Basic information on hand covers practically all methods and equipments in use. Lumber production by grades and size and conversion value of product available for all commercial species by tree diameters. Main use of data in advice and guidance. | No major studies planned. Will make necessary short time studies as need arises. |
| | Properties & Uses - Little-Used Species | Possibility of pulpwood and pulp production investigated. Possibilities in use of Engelmann spruce for aero stock investigated and samples of spruce sent to Madison Laboratory. Use of larch and ponderosa pine for veneer and plywood further investigated. Sample logs sent to Seattle plant. Investigated availability and usability of Douglas fir bark for cork. Investigated specifications and markets for white fir box shook. | Continue investigation of possibility of larch for veneer and plywood, Engelmann spruce for box lumber and aero stock, white fir, hemlock, and lodgepole pine for box shook, wood waste for ethyl alcohol, Douglas fir bark for cork, hemlock bark for tannin, tie slabs for fuel, etc. |
| Forest Products Statistics | Manufacturing Cost Statistics<br>Production Statistics<br>Selling Price Statistics | The forest products statistics data on file on production costs and values collected over the long period of years were immeasurably valuable in meeting the requests for information from War Production Board. All statistics collected as usual. The Census of Production was completed early in April. Preliminary estimates submitted early in March were only 2 percent off actual production. A special breakdown of production by counties was made. | Continue all forest products statistical studies, including census of production. Speed up collection, compilation, and analysis of results. Make information available on quarterly or monthly basis if possible and necessary. This project holds number 1 priority in division. |
| Wood Preservation | Service Test Records | Detailed information desired by a number of ranchers and agencies outside of the Forest Service regarding wood preservatives and treating processes was supplied. Inspected & prepared progress reports on 3 railway-tie test tracks, 2 fencepost tests and 2 telephone lines. In one of these cases final inspection was made. | Continue to contribute information and advice in response to specific requests. Prepare for publication an article on treatability and service life of native woods. Make final inspections to close out 1 pole study on Gallatin Forest & experimental fencepost project at Miles City. Inspect 7 other pole, post and tie installations. |

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REDIRECTION OF STATION'S RESEARCH PROGRAM TO MEET WAR TIME NEEDS - ACCOMPLISHMENTS 1942, PLANS FOR 1943

| Division | | Recommendations made by NRM Station (in answer to Forsling's letter of February 25, 1942 on Redirection of Research Program to War-time Activities) | Branch of Research's Approval or Disapproval of Station Recommendations of Redirection of Research Program (Forsling's Report, Station's Annual of July 2, 1942) |
|---|---|---|---|
| | | TECHNICAL ADVICE & GUIDANCE (EXTENSION) | |
| Forest Management<br>Silviculture | | Recommend technical advice and guidance in forest management problems when needed to secure maximum production of forest products for war emergency with least destruction possible to residual stands or young growth. | No particular recommendations made or suggestions offered. |
| Fire Protection | | Technical extension by this division is limited to giving technical advice and guidance based on specialized knowledge and past research experience to fire protection agencies, both public and private. Recommended carrying on this service to full extent and including protection plans for Army and Navy training camps, air fields and depots. | Recommended helping fire control organizations meet an increasingly critical fire situation; first by technical extension by seeing that fire control organizations are taking full advantage of the knowledge gained through past research, and second through making every effort to complete for immediate use improvements in fire danger measurements, man dispatcher meters, and similar tools. |
| Range Investigations | | This division provides considerable technical information of value in the war program through advice and guidance on better management and on species and methods for range reseeding at field day demonstrations and through conferences with stockmen and action agencies and at meetings of other groups. Recommend continuing such work; also publication briefer articles on results pertinent to war effort. | Urges effective participation in War Board activities which have high priority. Effective technical advice and guidance to administrators and stockmen in range management equally important. Station's understanding of sound livestock production as related to range resource puts us in position to help guide future production goals. Recommend preparation and release of articles, leaflets, circulars and farmers' bulletins of practical value in the present war livestock effort. |
| Forest Survey | | The division will continue to meet the increasing demand for basic information on the volume, size, quality and availability of saw timber and other special forest products within the region. | Recommends making the information available for war purposes as quickly as possible. Stresses making available current information for war purposes of the volume, size, quality and availability of timber, particularly critical species and location and capacity of primary forest industries. |
| Forest Products | | Based on data already available from "logging-milling studies," "forest products statistics" and "new uses and new forms of use" investigations. This division has been in the field of technical advice and guidance (Extension) for many years. Recommend keeping such information up to date and available at all times to meet requests. May mean compiling monthly reports on production requirements, prices and costs rather than quarterly, semi-annually or annually as in past. | Recommendations approved. Expects greatly increased work in this division supplying information on forest products to War Production Board. |
| | | NEW ACTIVITIES | |
| R(V) Products Supplies Surveys | | Recommended speeding up and increasing work in Products Division under "Forest Products Statistics" to be in position to provide war agencies with up-to-date information on production requirements, costs, prices and mill capacities. | R(V) Products Supplies Surveys formally recognized by Washington office in July 1942, and program on a broadened and continuing basis outlined, and organization and financing approved. Considerable work done under R(V) Products Supplies designation on special reports prior to July; the first being a report on amount of forest products being moved on rubber-tired trucks, called for in February. Station made responsible for such studies. |
| R(V) Y Emergency Rubber Kok-saghyz | | Not in station plans for 1942. Preliminary report made on availability and area of rabbit brush in region. | Station asked to cooperate with region in planting of Russian dandelion (Kok-saghyz) for seed production in Montana, May 21, 1942. |
| Cooperation U.S.D.A. War Boards | | Director Bradner attended first Regional Conference on Agricultural Goals September 15-16, 1941 at Salt Lake. Later attended Western Montana War Board Meeting. No member of station staff assigned on any State or County War Boards. | Asked Stations to cooperate fullest extent possible U.S.D.A. War Boards in region. |
| Post-War Planning | | Not in station plans for 1942. Director Bradner was asked (and accepted) to act in place of Major Kelley, who was detailed to Guayule Rubber Project, February 1942, as chairman of Subcommittee on Wild Lands for the Pacific Northwest Regional Post-War Planning Committee. | No particular reference this new project by Washington office - Research. |

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REDIRECTION OF STATION'S RESEARCH PROGRAM TO MEET WAR TIME NEEDS - ACCOMPLISHMENTS 1942, PLANS FOR 1943

| Division | | Accomplishments 1942 | Plans for 1943 |
|---|---|---|---|
| | | **TECHNICAL ADVICE & GUIDANCE (EXTENSION)** | |
| Forest Management<br><br>Silviculture | | Furnished technical advice to Bureau of Entomology and Plant Quarantine (Forest Insect Laboratory and Blister Rust Control) staff members on various forest protection and management problems. Wellner also furnished technical advice to Western Pine Association foresters on cutting practices and to group of Dept. Bureau of Plant Industry men on management practices in control of tree diseases. | Will continue to furnish technical advice and guidance whenever possible. Loss of Wellner to Navy will hamper station considerably in this field. |
| Fire Protection | | Continued advice and guidance to Federal, State and private protective agencies. Gisborne spent several weeks on work directly with and for Army preparing control plans for nine Army Posts in vicinity of Spokane, Great Falls, Cut Bank, Glasgow, Lewistown and Helena. | Use of partially trained personnel by all forest protective organizations in this region will justify marked increase in travel to supervise both fire danger measurements and meteorological work, the quality and dependability of which will suffer seriously. Continue work for Army - two weeks if they create Forester position on staff Ninth Corp Service Command as recommended - otherwise, three months by Gisborne on this. |
| Range Investigations | | Furnished technical advice and guidance to range administrators, stockmen and for use of U.S.D.A. War Boards. Prepared and released to livestock trade journals four timely articles on range management of especial value to the war efforts. Journal of Agricultural Research carried technical article on research methods. Published article providing tested results of grazing reseeded area to encourage further range reseeding. | Continue to furnish technical advice and guidance to range administrators, stockmen and War Boards. Continue to round up and release timely articles of value to war effort based on results of past and current research. Conduct empirical study on heavier stocking of mountain summer range that promises greater sustained meat production on some national forest ranges. |
| Forest Survey | | Provided special information on availability, quality and quantity of ponderosa pine and larch as a basis for determining feasibility of establishing veneer plant. Furnished Coulee and Bonneville dam engineers with detailed information of availability of forest products. Furnished Indian Service with special information. Provided special information on spruce and cedar poles. | Continue to make current information available on availability, volume, quality, size, etc. of commercial forest tree species and products. Be ready at all times to undertake special studies on raw material supplies for war agencies. |
| Forest Products | | The technical data and information on file in this office and the statistics currently compiled provided most of the basic information necessary to fill the ever increasing number of requests on forest products, requirements, production, costs and prices. These data were particularly helpful in planning R(V) Surveys and for a critical understanding of the production problems, handicaps and bottlenecks. | Continue to supply up-to-date and detailed information on forest products, requirements, production, costs, prices, mill capacities, new uses and forms of use, methods of logging and milling, and new equipment. |
| | | **NEW ACTIVITIES** | |
| R(V) Products Supplies Surveys | | Station made responsible for these studies - Director Bradner in direct charge for region. During year made special reports for War Production Board on transportation, labor, prices, costs, log production and inventories, factors affecting lumber and box lumber production, monthly lumber production and quarterly stocks on hand, dry kiln capacities, lumber requirements, pulpwood, lumber statistics, mill capacities, raw material supplies, and equipment surveys. Bradner spent 30.8 percent of his time on these studies - Whitney about 75 percent. Region made available part time of 2 logging engineers and 6 forest officers for field work in connection with studies. | Continue to make surveys and prepare reports as called for under R(V) Products Supplies Surveys. This job is rated No. 1 priority at this station. |
| R(V) Y Emergency Rubber Kok-saghyz | | Range Division contributed technical advice and guidance to regional office on Kok-saghyz project in soil preparation, use of fertilizers &other cultural operations including pretreatment of seed, germination and root tests for Missoula, Savenac and Miles City fields. Also supervised all field cultural and seed collecting operations on ten acres spring plantation and fall soil preparation on 25 acres and fall planting of 1 acre of plots at M.C. | Participate with regional office in planning and continue to provide technical guidance on Kok-saghyz program ten to twenty times larger then in 1942 and try to increase unit production and reduce costs. Numerous tests and plots involved in this. |
| Cooperation U.S.D.A War Boards | | No station representation on State War Boards. Bradner member Idaho Technical Committee on potential agricultural capacities. Made report on potential capacities Idaho and Montana sawmills and forests. Hurtt gave technical advice to War Board members on livestock goals and requirements and reviewed State and regional reports on potential capacities. | Have asked that Hurtt be placed as alternate on Montana U.S.D.A. War Board. Region Four has Forest Service representative of Idaho State Board. Will make available, as called for, technical information and basic data on livestock and forest products. Will cooperate to fullest extent possible. |
| Post-War Planning | | Director Bradner acting as chairman of Subcommittee on Wild Land (P.N.W. Regional Com.) re Kelley spent 6.7 percent of his time on this project. Supervised the preparation of Part One of the State plans for land resource conservation and development for Idaho, Washington and Oregon. Prepared section on timber production for Idaho. Attended all regional committee meetings. | Continue as acting chairman Subcommittee on Wild Lands. Supervise preparation final draft of Part One of State plans and start work on Part Two (post-war projects) for three Northwest states. Help in preparation of Regional Atlas. |

Incidentally, data from utilization surveys and from clippings and other studies on this range show that unherded sheep graze certain very desirable forage species more closely and more frequently than do cattle. These data, coupled with the observation that sheep tend to trample forage more severely, throw some definite light on the age-old charge that sheep may be more destructive to the range than cattle. However, it does not follow that sheep must be or always are more destructive under good management.

On the other hand, light utilization by herded sheep appears to be a growing problem on some national forest summer ranges. Evidence has been noted to indicate that a continuation of very light grazing by sheep on high mountain grass range at Vigilante may be responsible for what appears to be a progressive reduction of lamb weight, to greater difficulties of herding and that such light use is unnecessary for maintaining the soil or forage. In view of the demand for maximum meat production, there is urgent need for certain empirical tests of heavier grazing to determine practicable means for meeting objections to heavier stocking by permittees and to observe major effects of such a practice on this high summer range. Additional water for irrigation and greater winter feed production is now available to support increased numbers by stockmen in the lower Ruby Valley who use this range.

The plant development study at Vigilante indicates that the present June 1 opening date has been a conservative one for the lower cattle range and that it might open about a week earlier on the average. It also seems evident from past studies that this and similar

adjacent cattle range may be stocked more heavily to yield greater sustained meat production.

2. Artificial Revegetation Research

Results in 1942 of reseeding after cheap or no soil preparation on fields covered by a heavy stand of cheatgrass have not been especially promising, due partly to unfavorable weather conditions at a critical time last spring. The fact that many thousands of acres in western Montana are covered by this undependable annual grass of restricted value and that natural revegetation is very slow justifies continued search for a cheaper method of reseeding and greater production.

Cut-over and burned timbered areas reseeded in 1940 on the Bitterroot National Forest have resulted in a very encouraging stand and good production.

Range adaptation tests were held to a minimum, but installations of a few of the more promising species were made despite the fact that Merrick spent considerable time on Kok-saghyz work and was called into military service early in the fall.

The grazing value and high grazing capacity of crested wheatgrass was again demonstrated by a test with 21 yearling steers that gained at the average rate of 204 pounds in 84 days from April 28 to August 18 at Miles City. Gains per acre for the crested wheatgrass were at the average rate of 72 pounds per acre for four seasons as compared to 27.3 pounds per acre for native forage pasture during three seasons. The yearlings had approximately 1.9 acres of native range as compared to 0.7 acre of crested wheatgrass per month. Such

results, coupled with early growth of crested wheatgrass, provide definite encouragement for range reseeding even at a substantial cost.

B. Technical Advice and Guidance (Extension):

It is difficult to draw any distinct line between a research project and the use to which results will be put because one should merge into the other. However, a special effort has been made during the past year to round up and report in journal articles, mimeographed station notes, and otherwise the accumulated range information of particular significance in the war effort. Two such articles on management were carried in the Western Livestock Journal and one in the Cattleman. As a result of one of these articles - on earlier marketing of range cows - the University of Minnesota plans to conduct an experiment to determine whether feeders in that region can, with profit, acquire in late August or early September thin cows for later finishing rather than at later dates. Tests by the Minnesota Station have demonstrated that steers placed on cheap rough feed late in August make very high returns for this feed that is otherwise largely wasted. Early range marketing to a certain degree thus provides for more efficient meat production from both western range forage and rough feed on midwestern farms.

Another article on sheep range management by Woolfolk was carried in the National Woolgrower. The information in the foregoing articles was also carried in station notes to a considerable mailing list.

An article summarizing the grazing value of a field reseeded

to crested wheatgrass as compared to native range was also carried in the American Hereford Journal. This was reprinted in the Montana Stockgrower in January 1943. This information should give added impetus to range revegetation that has already resulted in reseeding of more than half a million acres during the past 3 or 4 years in Montana, mainly by cheap methods stressed in our research.

An article on a more technical phase of range management by Ellison, based on work done at this station prior to 1938, was carried in the Journal of Agricultural Research and another by Collins and Hurtt on measuring utilization is to appear in an early issue of Ecology. These various publications are listed in further detail elsewhere. It is believed that they provide a substantial basis for better range management and for sustained maximum food production.

Two manuscripts, one by Short and one by Hurtt, were submitted late in 1941 for departmental publications but have not yet appeared in print. The need for faster progress of formal publications was discussed in further detail in separate correspondence with your office.

The major task of preparing range utilization standards is another phase of technical guidance that remains to be fully accomplished, but progress was made during the year through results of utilization surveys and data from certain supplemental studies at Miles City and Vigilante.

A group of AAA field men spent 2 or 3 days as a training school in measuring utilization and in reviewing methods and results we have developed at Miles City. These results are being rounded up to support more definite specifications as to proper utilization standards. One

article has been written for Ecology about the method used and another is in rough draft.

A standard of utilization for mountain cattle range at Vigilante is also under development, based on past studies and a preliminary guide summarizing the results is in rough draft. This work, coupled with some support from clippings and quadrat studies, provides a fairly clear indication that heavier stocking is justified without damage to soil or forage on both cattle and sheep ranges at Vigilante with the promise of greater livestock production on a permanent basis. Clipping is a small job carried incidental to other work.

C. New activities:

Emergency Rubber Project - Kok-saghyz

This division has contributed a substantial amount of time to the development of technical phases of the Kok-saghyz emergency rubber project. At Miles City, Woolfolk handled all phases of the planting, culture and harvesting on 10 acres of Kok-saghyz planted there, while Merrick, Friedrich and Hurtt spent considerable time in assisting the Region by pretreating seed, making germination tests, and in fertilizer, root-sprouting and other short-term studies and by other activities needed to place the project on a sound cultural basis. Under the proposed expansion for 1943 of 10 to 20 times the initial acreage, additional technical and research effort will be essential for seed treatment and for sound guidance in soil fertilizer and cultural treatments needed for the quickest and best results.

SUMMARY:

The major part of the effort of the Range Division last year falls under one of the following classifications:

1. Technical advice and guidance to range administrators and stockmen. This has been largely in the form of several published articles and in research notes listed elsewhere. These have been widely distributed and have been of value to stockmen and range administrators and in establishing basic livestock production and marketing goals for western ranges.

2. Provided tested and dependable guides as to stocking; also certain other management and reseeding practices to promote maximum sustained production of range livestock.

3. Made further studies necessary for developing ultimate utilization standards for short-grass and mountain summer ranges and to assist men of other agencies in the use of such methods.

4. Given technical assistance in culture of Kok-saghyz as a part of the emergency rubber project.

II. PLANS FOR 1943

Both management and revegetation research work at Vigilante will be largely on a maintenance basis with one permanent man and possibly one summer assistant. An empirical study is planned to work out a practicable means of heavier utilization on sheep range and observe the effects on the sheep and the range under a definite but

extensive type of study.

No sheep will be grazed on the Miles City project, but such supplemental records on vegetal response as are necessary to round out the picture will be collected this season. The data since 1936 are being analyzed and Woolfolk will give high priority to writing a departmental publication.

The cattle range project should be continued by all means until the vegetation shows more definite response to heavy grazing in order that both economic and ecological interactions may be clarified without sacrifice of heavy investments already made as previously explained. This can be done with limited personnel.

The artificial revegetation work will be continued largely on a maintenance basis with especial attention to encouraging work that will make depleted ranges more productive. Efforts will be continued to get all research information published and in use as rapidly as possible. The Kok-saghys project is quite promising and cooperation to the fullest extent possible in technical help will be provided for whatever size program is finally set up.

## FOREST SURVEY

### Redirection to Meet War Needs

The principal changes in the Forest Survey during the past year have been in respect to personnel. Seven of the ten male staff members were lost to Survey - Brown, Pissot, and Metcalf to the armed forces, Winters, Hutchison, and Johnson as transfers elsewhere in the Service and Welton to Guayule. These losses were partially

compensated by two replacements.

Meanwhile, Survey assumed new responsibilities notably the stenographic and clerical duties of the Division of Forest Products, releasing Miss Bouchard to Guayule. Survey also assisted in the compilation of Census reports. In addition, up to 40 percent of Survey's one-man drafting facilities were committed to the preparation of military maps. Also during October and November, Royer and Zach were loaned to Guayule for the urgent nursery expansion program.

Status of Work and Accomplishments - 1942

Initial inventory and growth data have been completed for the Inland Empire and for Chouteau and Fergus Counties in eastern Montana. This embraces 40 million acres of gross land area, 27 million acres of forest land area or 73 percent of the region's forest land total. Detailed fire drain summaries for the period 1931-37 are now available for all counties in the Inland Empire and cutting drain and local requirements for the entire region. Cover type maps available total 39 million acres on the 2-inch scale, 32 million acres on the 1-inch scale.

Basic statistics for Western Montana are summarized and work is under way on the report for this subregion. The Ravalli County report is being revised for final form. Statistical reports for Fergus and Chouteau Counties are ready for mimeographing.

During the year 0.7 million acres of forest land, 2.0 million acres of gross area, was mapped in eastern Montana. Area and volume compilation covered 2.4 million acres of forest lands, 8.5 million acres of gross area. Maps drafted (gross area basis) covered 5.8

million acres on the 2-inch scale, 3.4 million acres on the 1-inch scale.

A detailed report was released during the year on "The Forest Situation in Lincoln County"; statistical releases were issued for six Western Montana Counties - Missoula, Lewis & Clark, Deerlodge, Silver Bow, Powell, and Granite.

Use of Survey Data

Wherever available Survey maps and volumes were used for, and greatly facilitated, the regional transportation planning study. This study in turn forms the basis of the access road program aimed to open up inaccessible timber stands and to stimulate regional lumber production.

As a basis for over-all management plans the Kootenai, Bitterroot, Flathead, St. Joe, and more recently the Cabinet are using Forest Survey statistical data and maps. The net effect in all cases has been a materially greater "allowable cut" than could be justified under former plans based on intensive cruises of only portions of the commercial saw-timber volumes and with little or no consideration of pole stands.

At the request of Mr. Lee Muck, Assistant to the Secretary of Interior and in charge of land utilization, Survey supplied more detailed information on public domain lands of the region than is given in the published releases. He characterizes this information as "highly important." Arrangements have been made with Mr. Muck for an annual report of timber sales on public domain as a means of periodic adjustments of Survey records.

Ravalli County offers an example of the beneficial indirect effect of Forest Survey activities on ownership consolidations. Ownership status collected before field work showed scattered forties of public domain intermingled with private ranch land in the vicinity of the river. The exact ownership status of these lands was generally unknown to the adjacent landowners. Most of them were used in trespass for grazing or other uses. The field work stimulated interest and requests to the General Land Office for their purchase. Today practically all of this public domain is a part of the adjacent ranch units where it rightfully belongs, and the General Land Office is relieved of the task of its proper administration.

As a basis of determining the feasibility of establishing a veneer plant in this region and as a means of meeting the increased demand for plywood, the inventory volumes of ponderosa pine and western larch in saw-timber stands of these types in western Montana were segregated by tree diameter classes. The results show that for this subregion as a whole, 62 percent of the volume of ponderosa pine and 53 percent of the volume of western larch occurs in trees over 25 inches d.b.h. Respective volumes are: 4.6 billion and 4.3 billion board feet log scale. According to I. V. Anderson, approximately 30 percent of these volumes or 1.4 billion feet of ponderosa pine and 1.3 billion feet of western larch is of veneer grade quality.

Fergus County, through its extension agent, recently ordered 105 township cover type maps - a complete coverage for the county.

They are to be used to improve land-use planning and administration. It is not the intention, as might be implied, to increase assessments on the basis of forest cover values but rather to reduce the assessments of lands classified as grazing that are wholly or partially stocked with forest. This is the first instance in the region of a county administrative agency availing itself of this Survey facility.

Priority and Plans for 1943

1. Complete the Ravalli County report.
2. Issue statistical summary reports for Western Montana, Fergus, Choutsau, and Judith Basin Counties.
3. Prepare and issue a lithograph cover type map for northern Idaho and western Montana.
4. Complete a comprehensive report on the forest situation of western Montana.
5. Resurvey Benewah and Kootenai Counties.

## FOREST MANAGEMENT RESEARCH

The three general objectives set up under the redirection of research programs to wartime needs have been attained in both fire and silvicultural research. Field work, travel, and all indirect costs were materially reduced during 1942. Several projects have been closed and others shelved or greatly reduced as the personnel formerly occupied on them has departed for military service or been transferred to war-essential projects elsewhere. By combining the two divisions of Fire and Silviculture into one of Forest Management,

the replacement of one division chief was avoided. In total, the technical force of 7 men on the pay roll January 1, 1941, was reduced to 5 in 1942, and is now down to 3.

Fire

The redirection of this work to meet war needs has, in addition to liberating men for military service, concentrated on two projects of direct applicability. The first, as suggested by your office, was an improvement in the fire danger meter which is an aid to inexperienced men in judging fire danger and in determining the proper size and cost of the presuppression organization. New meters were issued for this purpose in June 1942 for trial on the 17 National Forests in this region. Results were highly satisfactory as a majority of the supervisors recommended their official adoption in 1943.

The second project given top priority was direct cooperation with the Ninth Service Command of the Army to examine the grass, brush, and forest fire dangers within and adjacent to several Army Posts in this region, and to prepare initial plans for protection from such fires. This was done by Gisborne for nine Posts from Spokane, Washington to Glasgow, Montana. Recommendation also was made that training be given to Army officers and men in the Austin rotary method of fighting grass fires. Ranger Austin himself was accordingly sent by the regional office, and this training was provided at several Posts. Much more will be needed in 1943.

Finding that rapidly changing Army personnel will require repeated inspection, training, and supervision of the fire control work, and that at some Posts timber sales are not only possible but

are silviculturally desirable, Gisborne prepared a special recommendation that a forester be selected and commissioned on the staff of the Ninth Service Command. The Army has asked for names of qualified candidates and two men - one an ex-forest supervisor, one an ex-assistant supervisor, both now in the Army - have been recommended. If carried through, this procedure may produce material benefits in fire control cooperation from the Army.

Fire research plans for 1943 call for a bare continuation of routine weather, fire danger, streamflow, and snow course measurements by Crowe at Priest River, the completion of the 30-year weather summary by Stickel, and the preparation of several reports including a fuel reduction manual for use after the war by Gisborne. If the Army does not create the fire control position recommended, Gisborne will continue to give time to this work. Examination of nine bomb target fields and preparation of plans to prevent the escape of fires has already been requested by the Army.

Silviculture

Very little silvicultural research can be expected to produce results that will contribute directly to winning the war. Most of our past and present work, however, is deemed essential to winning the peace, and to the guidance of post-war uses of labor not absorbed by industry. Furthermore, much of the work under way is directly related to programs and plans of the office of Blister Rust Control and the Bureau of Entomology and Plant Quarantine.

The following table shows the number of plots measured in 1942 and the number requiring work in 1943 by projects. Figures in

parentheses represent plots on which inclement weather prevented work in the fall of 1942 and which therefore must be added to the 1943 early spring job load.

| Line of Work | Year 1942 | Year 1943 |
|---|---|---|
| | No. of Plots | |
| **Harvest cuttings** | | |
| White pine, partial cuttings | 27 | 10 |
| Ponderosa pine | 3 | 0 |
| Defective tree disposal | 2 | 4 |
| Slash disposal | 0 | 1 |
| Natural regeneration | 1 | 1 |
| **Stand improvement** | | |
| White pine, thinning | 0 | 14 |
| White pine, pruning | 8 | 6 |
| White pine, cleaning | 1 (1) | 0 (1) |
| Ponderosa pine, thinning | 0 | 10 |
| Ponderosa pine, pruning | 1 | 4 |
| **Mensuration** | | |
| White pine, uncut stands | 16 | 11 |
| **Regeneration** | | |
| Direct seeding | 22 (21) | 13 (21) |
| Plantations | 1 (1) | 0 (1) |
| Totals planned | 98 | 74 |
| Totals done and to do | 75 | 98 |

Efficient execution of this "maintenance" work load now largely hinges on one man, Helmers, who is under a local resident's appointment as Principal Agricultural Aid. He is the only man left

on the staff with personal knowledge of the location of 80 of these 98 plots. His draft status is 3-A, but his eyes are 20-300.

## FOREST PRODUCTS RESEARCH

All of the work projects under way at this station on forest products and utilization research were classified as being A-1 war activities in the redirection of the program with the exception of the wood preservation studies which were placed on a maintenance basis. At the beginning of the fiscal year the allotment for this major line of investigative work was cut 17.8 percent. The staff, which at the beginning of the year was composed of Whitney and Miss Bouchard, was reduced to Whitney alone when Miss Bouchard transferred to the Emergency Rubber (Guayule) Project in California. Miss Bouchard handled a number of the forest products statistical studies such as selling prices, (lumber, logs, and cedar products) and the manufacturing cost records. Miss Mead, clerk-stenographer for the Forest Survey Division, has taken over the clerical work for the Products Division and the selling price projects. Late in December a technical assistant was added to the staff.

The large amount of detailed forest products statistics on file in this division furnished the basis for estimating and planning a number of R(V) Products Supplies Surveys.

### Accomplishments During 1942

### Timber harvesting and conversion studies

No new studies were undertaken during the year under this heading. Some Englemann spruce logs, selected from three separate

localities, were shipped to the Madison Laboratory for test runs to determine the amount of aircraft lumber they might contain.

Some western larch and ponderosa pine logs were shipped from western Montana to a commercial veneer and plywood plant in Seattle for a test run as to their suitability for veneer and plywood.

Announcement was made (January 1943) that a company had been organized to cut lumber and veneer at a plant now operating at Polson on Flathead Lake in western Montana and further intentions of going into pulp production after the war.

Forest Products Statistics

Data were collected and reports compiled on all of the production, costs, and price studies carried under this heading in 1942 as has been the case for the past 25 years. More intensive uses and breakdowns were made of these records during the past year.

A preliminary estimate of the Idaho-Montana lumber cut for 1941, needed by the War Production Board, was forwarded to Washington prior to March 15, 1942. This estimate proved to be within 2 percent of the actual total quantity shown by final figures after all sawmill operators had submitted their lumber census reports.

A special compilation of 1941 lumber production in the Northern Rocky Mountain Region and in Southern Idaho, by counties, was sent to Washington in April 1942 for use by the War Production Board.

Total production of lumber in this region, including match plank, sawed ties, and sawed mining timbers for 1941 amounted to 1,257,660 M feet as compared with 1,121,905 M feet in 1940. Total production of match plank amounted to 88,732 M compared with 80,165

M feet in 1940. Production of sawed ties totaled 1,640,290 pieces in 1941, compared with 1,352,896 pieces for the preceding year. The total 1941 cut of cedar poles and piling amounted to 448,425 pieces, the largest output reported in many years.

Preliminary 1941 log prices and a report of the 1941 stumpage transactions in this region were prepared and distributed. The figures on log prices covered transactions totaling 268,313,000 board feet log scale with a total value of $3,168,346. The stumpage price figures were based on saw-timber transactions aggregating 721,748,000 board feet log scale, showing a total value of $8,179,301.

Western Montana's Christmas tree cut for 1941 as shown in our Research Note No. 19, released in April 1942, amounted to 3,082,650 trees, compared with 2,338,350 trees in 1940.

Records showing the annual production of pulp logs in Montana from 1927 to 1941 by species and by counties, together with information regarding the utilization of these logs and a copy of Station Paper No. 4, "Possibilities of Wood-Pulp Production in the Northern Rocky Mountain Region", were furnished the State Department of Agriculture, Labor, and Industry, Helena, Montana upon request.

All of the railroads purchasing ties in Inland Empire territory furnish up-to-date information for use in the Products semi-annual review of cross-tie specifications and prices. On April 15, 1942 the Northern Pacific and Great Northern Railway Companies (the two largest purchasers of ties in this region) were procuring larch, Douglas-fir, and ponderosa pine cross ties at a cost of $21 per M

board feet lumber tally. This rate was $8 per M feet higher than these companies had been paying during the same month in 1940. The Chicago, Milwaukee, St. Paul & Pacific Railroad, which had been out of the market in this region during the first nine months of last year, resumed buying ties in Inland Empire territory in October 1942 at a basic price of $24 per M. Effective January 1, 1943, in line with ceiling prices authorized by the Office of Price Administration, the Northern Pacific increased its prices to $23.50 per M.

Sawlog drain tables for 1941 were compiled. Tabulations showing the annual drain in the form of sawlogs by counties and by species in the Northern Rocky Mountain Region and in southern Idaho, from 1925 to 1941 inclusive, are now available.

A map showing the approximate location of all sawmills and shingle mills in Inland Empire territory, using a legend to distinguish mills of different sizes, was prepared, together with a tabulation of the total mill capacity for each county within the area. This material was requested by the Pacific Northwest Forest Experiment Station for use by the Pacific Northwest Regional Council.

Wood Preservation

Some extension work in connection with a number of inquiries regarding new preservatives and methods of treating fence posts was done. Although most of these inquiries came from ranchers, a county extension agent at Billings and an associate soil conservationist at Thompson Falls, Montana also requested information of this kind. Recommendations emphasizing the advisability of using preservatives

of known worth, as well as copies of selected publications, were furnished in each case.

Inspections of three railway-tie test tracks, two fence post tests, and one telephone line were made as planned for 1942. In addition, a thorough final inspection was made of the butt-creosoted experimental lodgepole pine pole stubs in the old Choteau-Ear Mountain telephone line, which has been replaced by a new heavy-duty pole line capable of meeting present-day requirements.

Forest Supervisor Ferguson and District Ranger Hinman of the Lewis and Clark National Forest participated in this inspection. The records collected show that of the 449 stubs originally set in October 1917, 17 had been removed for causes other than decay, 1 stub had been removed in 1941 on account of internal butt decay, and 431 were in line and entirely free from decay in the treated butts. Only 10 stubs were found to be decaying in the tops. Two other stubs had been considerably damaged by lightning.

The 419 stubs classed as being in good condition after 25 years of service will be salvaged for use as fence posts. Although this study must now be considered closed, these stubs will undoubtedly give several more years of good service in the fence lines where they are to be reset.

Plans for 1943

No new studies have been planned under the "Timber Harvesting

and Conversion" project. Short-term studies and surveys will be undertaken to fill gaps in information or to obtain new information on logging and milling methods and equipment and new uses and new forms of use for forest products as the need arises. There were no major changes in logging and milling methods and equipment in the region in 1942. Unavailability or shortages in some pieces of equipment may necessitate special studies during 1943.

All of the Forest Products Statistics studies on production, costs, and prices will be continued in 1943. An attempt will be made to speed up the work of collection and compilation, making the data more current.

The division will continue to contribute information and advice on the preservative treatment of forest products in response to specific requests. Final inspections will be made to close out one pole line study on the Gallatin Forest and the experimental fence post project at Miles City. If manpower and funds permit, seven other pole, post, and tie installations will be inspected and progress records prepared. It is planned also to prepare for publication an article on the treatability and service life of native woods.

R(V) Products Supplies Surveys

Accomplishments during 1942

The first work undertaken under this program during 1942 was the report on the movement of forest products on rubber within the region. This was a study to determine the extent of the dependence of the wood products industries upon rubber tires and trucks. Neff, Koch and Bradner made the report for the Northern Rocky Mountain region. Suggestions were made advocating other systems of transportation and economies in the use of rubber tires. A special and more detailed study was made on truck hauls of lumber and logs versus railroad transportation in the Bitterroot Valley by West of the Region One Regional Office.

Incidental information was gathered on the factors affecting lumber and box shook production in the region in March by Bradner on the annual lumber and log manufacturing cost trip. All information required by this region in connection with a nation-wide survey of pulp and pulpwood production conducted by the Forest Service for the War Production Board was collected at the request of Director Wyckoff of the Pacific Northwest Station.

Three quarterly reports on the factors affecting lumber and box production and on log production and inventory for the Inland Empire region were made under the station's supervision during 1942. These reports were based on interviews with lumber company managers, sales managers, logging and mill superintendents, woods and mill workers and logging contractors representing 45 companies. The companies, large,

medium and small were responsible for approximately 88 percent of the total lumber cut within the region in 1941. The field work and report writing was done by five forest officers, Neff and West of the Region One office of Timber Management, and Bradner.

The director tried and finally arranged for the furnishing by the Western Pine Association of monthly lumber production and quarterly stocks on hand figures by species to the War Production Board for the States of Idaho, Montana, Oregon, Washington, California and Arizona.

The station handled the dry kiln survey for non-association mills within the region. This was a study to determine dry kiln facilities and the amounts of lumber by species and grades that could be kiln-dried within the region.

"Quickie reports" were made on the gross amount of wire needed for use in binding carload shipments of poles, pilings, pulp, log and mine timbers within the region and an estimate of the number of log and lumber trucks by sizes in use in 1942 and replacement needs for 1943. An estimate was also made of the number in use and replacement needs for oversize log trucks and trailers.

A report was made for the use of U.S.D.A. War Boards and your office on the potential capacity of Idaho and Montana forests and sawmills to meet production goals.

A study was made (see Forest Survey section) of the inventory volume of ponderosa pine and western larch in sawtimber stands in western Montana suitable on a size class basis for veneer and plywood.

Supplemental reports were made and submitted to your office on the labor and manpower situations within the region.

The station also submitted two reports to the Region One Office of Timber Management, for transmittal to the Washington Office, on the fuelwood situation in certain localities in the Inland Empire region.

Plans for 1943

This station is prepared to make the studies and surveys in this region that may be called for under the R(V) Products Supplies Surveys program during 1943. Though the station is responsible for the surveys in this region, the administrative branch of Region One supplies most of the manpower for the field work. At the station, 75 percent of Whitney's time, 30-40 percent of Bradner's and 15-25 percent of Kemp's time will be spent on this program or on the collection of basic information that is necessary in planning and making the surveys. The Region (One) will contribute up to 25 percent of the time of its two top logging engineers and approximately 10 percent of the time of five or six high class forest officers.

Before the proposed equipment survey is undertaken in this region, a check will have to be made as it is understood that the Western Pine Association has called on its member mills for a very detailed and comprehensive survey of logging and milling equipment in use and for replacement needs. You will understand the difficulty of starting a survey of our own under such a situation.

The Emergency Rubber (Kok-saghyz) Project

The write-up in the Range section of this report gives an adequate

description of the work performed by members of this station on the Russian dandelion project during 1942.

Tentative plans for 1943 indicate a Kok-saghyz planting project in Montana 10 to 20 times the 1942 program. The station will participate with the Regional Office in planning the greatly increased program, if such is authorized, and will continue to provide technical guidance, particularly with a view to increasing unit production and reducing the cost of culture and seed harvesting. This will involve the setting up and inspection of numerous test plots.

Camouflage Plantings for Military Installations

At the request of the Washington Office, Leon C. Hurtt, in cooperation with J.R. Peterson of the Division of Recreation and Lands, spent considerable time working up information on methods of planting grasses, legumes, trees and shrubs suitable for semiarid portions of Montana.

Several grasses and legumes were suggested for use in vegetating airfields, including runways, and for covering operational scars in the plains and foothills embracing the eastern 65-70 percent of Montana. The discussion covered the site, soil adaptation, culture, seeding rate, drilling, covering and favorable and unfavorable aspects of each species. A few weeds were also mentioned.

Mr. Peterson prepared a list and discussion of trees and shrubs suitable to semiarid conditions of Montana. This information was incorporated with our report and typed up in our office.

At the request of your office, Hurtt and Friedrich of this station reviewed the manuscript prepared by Pearce of the Intermountain

Station on "A Guide for the Revegetation of Military Areas in Arid Regions" and submitted their comments.

Post-War Planning

The station participated actively in the post-war planning project for the Pacific Northwest states of Idaho, Oregon and Washington. This is the post-war planning committee formerly under our Chief Forester Lyle F. Watts.

Director Wycoff succeeded Mr. Watts as chairman. Director Bradner is acting chairman of the subcommittee on wild lands and participated in all of the meetings of the regional committee held during 1942. He is, with Regional Conservator Christ, responsible for the preparation of Part One of the state plans for land resource conservation and development in Idaho, Oregon and Washington. Considerable work was done on this phase of the work in all three states. This station prepared the preliminary report on timber resources. Some work was also done on planning and compiling the regional atlas.

For post-war planning, the State of Montana is in the Great Northern Plains region under a B.A.E. chairman. No requests for information have as yet come from this committee.

The station plans to participate in the work of the Pacific Northwest Regional Planning Committee during 1943.

## PUBLICATIONS

### I. PUBLISHED DURING 1942

#### A. Departmental Bulletins and Circulars

None

#### B. Outside Publications

Ellison, Lincoln
A comparison of methods of quadratting short-grass vegetation. Jour. Agric. Research, vol. 64, no. 10, May 15, 1942. Government Printing Office, Washington.

Gisborne, H. T.
Mileposts of progress in fire control and fire research. Journal Forestry, August 1942. Government Printing Office, Washington.

Hayes, G. Lloyd
Differences in fire danger with altitude, aspect, and time of day. Journal Forestry, April 1942. Government Printing Office, Washington.

Hurtt, Leon C.
Increased beef production through conservative stocking on Northern Great Plains ranges. Western Livestock Journal, June 15, 1942.

Hurtt, Leon C.
Earlier marketing of range cows - is this a desirable range management practice. The Cattleman, November 1942.

Hurtt, Leon C.
Should range men market range cows earlier? Western Livestock Journal, September 1942.

Hurtt, Leon C.
Crested wheatgrass range builds beef. The Hereford Journal, October 15, 1942.

Rapraeger, E. F.
Timber and metals. The Timberman, vol. 43, no. 4. February 1942. (Article prepared while author was in the employ of the Forest Service.)

Whitney, C. N.
Report on Northern Pacific test tracks at Plains, Thompson Falls, Missoula, and Lolo, Montana. Proc. American Wood Preservers' Assoc. January 1942. (Reprinted in Cross Tie Bull, vol. 23, no. 3, March 1942.)

Winters, R. K.
Need for further wood processing in northern Idaho. Idaho Forester (Moscow), vol. 24, pp. 7-10. 1942.

Woolfolk, E. J.
Better production from short-grass ranges through conservative sheep grazing. The National Woolgrower, November 1942.

C. Multilithed and Mimeographed Progress Reports

Division of Forest Products
Cost of manufacturing lumber exclusive of interest and discount, for Inland Empire sawmills during 1941. (Confidential - not for distribution.) Mult. April 1942.

Division of Forest Products
Review of cross-tie specifications as of April 15, 1942. Mimeog. April 1942.

Division of Forest Products
Preliminary 1941 log prices in the Northern Rocky Mountain region in 1941. Research Note no. 23. Mimeog. and mult. June 10, 1942.

Division of Forest Products
Stumpage transactions in the Northern Rocky Mountain region in 1941. Mimeog. June 20, 1942.

Division of Forest Products
Preliminary figures on production of lumber, lath, and shingles in Montana, northeastern Washington and Idaho - 1941. Mult. May 1942. (Distributed July after approval by Census Bureau.)

Division of Forest Products
Lumber production by years in the Northern Rocky Mountain region. Revised June 1942 to include 1941 figures. Mimeog. (Distributed July after approval by Census Bureau.)

Division of Forest Products
Amendment to review of cross-tie specifications issued April 15, 1942. Mimeog. October 17, 1942.

Division of Forest Products
Cedar products prices as of December 1, 1942. (Confidential - not for distribution.) Mimeog. December 1942.

Division of Forest Survey
Forest Statistics for Missoula County, Montana. Mult. June 1942.

Division of Forest Survey
Forest Statistics for Lewis & Clark County, Montana. Mult. June 1942.

Division of Forest Survey
Forest Statistics for Deerlodge County, Montana. Mult. June 1942.

Division of Forest Survey
Forest Statistics for Silver Bow County, Montana. Mult. June 1942.

Division of Forest Survey
Forest Statistics for Powell County, Montana. Mult. August 1942.

Division of Forest Survey
Forest Statistics for Granite County, Montana. Mult. August 1942.

Gisborne, H. T.
New facts on lightning. Research Note no. 24. Mimeog. June 25, 1942.

Hayes, G. Lloyd
A discussion of hygrographs. Research Note no. 25. Mimeog. July 14, 1942.

Hurtt, Leon C.
Cattle production increased on Northern Great Plains ranges under conservative stocking. Research Note no. 22. Mult. May 1942.

Hurtt, Leon C.
Earlier marketing of range cows - is this a desirable range management practice. Research Note no. 26. Mimeog. August 1942.

Hutchison, S. B.
The forest situation in Lincoln County, Montana. Forest Survey release no. 20. Mimeog. March 1942.

McKeever, D. C.
Direct seeding of western white pine using poisons for rodent control. Research Note no. 18. Mimeog. March 29, 1942.

McKeever, D. C.
Results of direct seeding of ponderosa pine in the Northern Rocky Mountain region. Research Note no. 20. Mimeog. May 1, 1942.

McKeever, D. C.
Results of direct seeding of western red cedar and Engelmann spruce in the northern rocky mountain region. Research Note no. 21. Mimeog. May 8, 1942.

Whitney, C. N.
Christmas tree production in western Montana in 1941. Research Note no. 19. Mimeog. April 25, 1942.

Woolfolk, E. J.
Better production from short-grass ranges through conservative sheep grazing. Research Note no. 27. Mimeog. November 1942.

## II. ESTIMATE OF DEPARTMENTAL PRINTING NEEDS

A. Formal Manuscripts to be Submitted for Departmental Publication Prior to June 30, 1943.

None

B. Formal Manuscripts to be Submitted for Departmental Publication During Fiscal Year 1944

Kemp, Paul D. et al
The forest situation in western Montana. U. S. Dept. Agric. Misc. Pub. 50 to 60 pages, illustrated, 35 charts, 10 pictures.

Hurtt, Leon C.
Management of Northern Great Plains ranges to minimize the effect of drought. (Re-submitted January 1941 - not yet published.)

Short, L. R.
Reseeding to improve Montana range lands. Farmers' Bulletin no. 1924. Government Printing Office, Washington.

Woolfolk, E. J.
Management of short-grass range for sustained sheep production. A departmental circular - 3,000 to 4,000 copies.

## III. ARTICLES AND OTHER MANUSCRIPTS PROPOSED FOR OUTSIDE PUBLICATION DURING CALENDAR YEAR 1943

Collins, Robert W. and Leon C. Hurtt
A method for measuring utilization of bluestem wheatgrass on experimental range pastures. (To appear in Ecology, January or April 1943.)

Gisborne, H. T.
The challenge to our society. Submitted in December 1942 to Journal Forestry. (This is the material previously proposed under the title, "Whence and Whither Forestry.")

Gisborne, H. T.
Sociological shackles on forestry. Submitted to The Ames Forester in January 1943.

Hayes, G. Lloyd
Reliability of the Forest Service type rain gage. Accepted in July 1942 by Monthly Weather Review.

Hayes, G. Lloyd.
Where and when to measure forest fire danger. Now in first draft of manuscript. Intended for Journal Forestry.

Hayes, G. Lloyd
A method of measuring rainfall on windy slopes. Hayes took this with him to Appalachian Station for final revision.

Holscher, Clark E.
Resistance of bluestem wheatgrass and blue grama grass to varied height and frequency of clipping. Probably for Ecology.

Whitney, C. N.
Treatability and service life of native woods.
For The Timberman.

Whitney, C. N.
The suitability of lodgepole pine for telephone and power line poles. For the Electrical World.

Woolfolk, E. J.
Salt and bonemeal mixture used by breeding cows on short-grass ranges during summer months.
Probably for the Western Livestock Journal.

*On military furlough but on payroll to February 1943.

# DIRECTORY OF PERSONNEL

## NORTHERN ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

January 1, 1943

### OVERHEAD ADMINISTRATION

| ion Over. | R(V)-Products Supplies | | New War Activities (Rubber project (Post-war Planning (War boards, etc. |
|---|---|---|---|
| 59% | Melvin I. Bradner | 31% | Director 10% |
| 100% | S. Dagmar Nelson | -- | Senior Clerk -- |
| 100% | *Mary J. Pershina | -- | Jr. Administrative Assistant -- |
| 85% | *Helen B. Davis | 10% | Assistant Clerk-Stenographer 5% |

### FIELD STATIONS

| | |
|---|---|
| Deception Creek Experimental Forest | L. A. Williamson (winter caretaker) |
| Priest River Experimental Forest | John D. Crowe |
| Miles City Experimental Range | E. Joseph Woolfolk |
| Vigilante Experimental Range | Grant A. Harris |

### DIVISION OF FOREST MANAGEMENT

| . Inv. | | Fire Inv. | Calendar Year 1942 Mens. | Regen. |
|---|---|---|---|---|
| 5% | Harry T. Gisborne | 95% | Senior Silviculturist 0 | 0 |
| 86% | *Charles A. Wellner | -- | Associate Silviculturist 9% | 5% |
| 18% | Paul W. Stickel | 73% | Silviculturist 9% | 0 |
| 66% | Austin E. Helmers | -- | Principal Agricultural Aid 33% | 1% |
| -- | John D. Crowe | 100% | Junior Agricultural Aid 0 | 0 |
| 9% | Vandella I. Johnson | 91% | Assistant Clerk-Stenographer 0 | 0 |

### DIVISION OF RANGE RESEARCH

| . Mgt. | | Artificial Reseed. | Kok-saghyz & War Bds. New War Activities |
|---|---|---|---|
| 70% | Leon C. Hurtt | 25% | Senior Range Examiner 5% |
| 89% | E. Joseph Woolfolk | 2% | Associate Forest Ecologist 9% |
| -- | C. Allan Friedrich | 100% | Assistant Range Examiner - |
| 94% | Clark E. Holscher | 4% | Assistant Range Examiner 2% |
| 97% | Grant A. Harris | 3% | Junior Range Examiner - |
| 91% | Clifford G. Pool | 2% | Junior Range Examiner 7% |
| 95% | Anthony B. Evanko | 5% | Assistant Agricultural Aid - |
| 81% | Merton J. Reed | 1% | Assistant Agricultural Aid 18% |
| 82% | Henrietta A. Flood | 16% | Assistant Clerk-Stenographer 2% |

### DIVISION OF FOREST PRODUCTS

| Harv. & Conv. | | Forest Statistics | Wood Pres. | New War Act. R(V)P.S. |
|---|---|---|---|---|
| 4% | Chester N. Whitney | 80% | Associate Forester 12% | 4% |
| 30% | John L. Timm | 70% | Junior Forester | |

### DIVISION OF FOREST SURVEY

| | Forest Survey | |
|---|---|---|
| Paul D. Kemp | 85% | Associate Forest Economist 15% |
| William L. Royer | | Assistant Forester |
| Lawrence W. Zach | | Junior Forester |
| John B. LaCasse | | Statistical Draftsman |
| Catherine M. Mead | | Assistant Clerk-Stenographer |
| Helen I. Forney | | Assistant Statistical Clerk |
| Mary E. Stevens | | Jr. Calculating Machine Operator |

### FOREST BIOLOGY (in cooperation with Fish & Wildlife Service)

| | |
|---|---|
| Forrest S. Romero | Junior Biologist |

*On military furlough but on payroll to February 1943.

DISTRIBUTION OF DIRECT COSTS BY MAIN PROJECTS

F.Y. 1945

## DIRECT AND INDIRECT COSTS BY FINANCIAL PROJECTS

F.Y. 1945

| Financial Project | Indirect Project Costs (Overhead) | Direct Project Costs | Total Costs |
|---|---|---|---|
| Forest Management | $ 2,755 | $ 23,822 | $ 26,577 |
| Range Investigations | 3,919 | 26,693 | 30,612 |
| Forest Products | 2,335 | 7,891 | 10,226 |
| Forest Survey | 3,300 | 21,756 | 25,056 |
| Total | $ 12,309 | $ 80,162 | $ 92,471 |

DISTRIBUTION OF DIRECT COSTS BY MAIN PROJECTS

F.Y. 1943

| Financial and Work Project | Cars, maintenance & new | Scientific equipment, etc. | Travel expenses other than cars | Salaries | | Total |
|---|---|---|---|---|---|---|
| | | | | Regular | Temporary | |
| FOREST MANAGEMENT | | | | | | |
| Silvicultural Inves. | 150 | 475 | 458 | 6,560 | 3,385 | 11,008 |
| Mensuration Inves. | | | 189 | 580 | 526 | 1,295 |
| Regeneration | -- | -- | 82 | 246 | 311 | 639 |
| Fire Protection Inves. | 140 | 472 | 250 | 9,330 | 708 | 10,880 |
| Totals | 290 | 947 | 939 | 16,716 | 4,930 | 23,822 |
| RANGE INVESTIGATIONS | | | | | | |
| Grazing Management Inv. | 274 | 600 | 715 | 16,022 | 2,647 | 20,258 |
| Artificial Revegetation | 117 | 300 | 315 | 5,201 | 502 | 6,435 |
| Totals | 391 | 900 | 1,030 | 21,223 | 3,149 | 26,693 |
| FOREST PRODUCTS | | | | | | |
| Timber Harvesting & Con. | 85 | 280 | 300 | 1,245 | 1,200 | 3,110 |
| Forest Products Stat. | -- | 60 | 50 | 3,474 | 308 | 3,892 |
| Wood Preservation Inv. | 25 | 25 | 52 | 787 | -- | 889 |
| Totals | 110 | 365 | 402 | 5,506 | 1,508 | 7,891 |
| FOREST SURVEY | | | | | | |
| Survey Forest Resources | 250 | 422 | 2,000 | 16,384 | 2,700 | 21,756 |
| GRAND TOTAL | 1,041 | 2,634 | 4,371 | 59,829 | 12,287 | 80,162 |

January 1943

# SUPPLEMENTAL MEMORANDUM

To Annual Report

C. Y. 1942

R-NEM
REPORTS
Station Annual

MEMORANDUM FOR BRANCH OF RESEARCH

A Brief Analysis of the Station's Financial and Personnel Situation and Program and Plans to Supplement the 1942 Annual Report

A year ago in January 1942, the station in preparing its annual report set about to reorient its program and plans to meet the rapidly changing situation due to the war emergency. Plans were recommended to speed up the work in Forest Products research and the Forest Survey in anticipation of the need for detailed and up-to-date information on forest products as a critical war material.

In February, the station was asked to redirect its program to war-time needs and all projects were given a critical scrutiny and then classified on a war, post-war, maintenance and non-urgent basis. Extension work through technical advice and guidance was emphasized and approved. This culminated in the April 1, 1942 report of the Branch of Research to the Bureau of the Budget. This station's plans for the redirection of its research program to war-time activities was commented on, adjusted and approved in Mr. Forsling's Stations' Annual Report letter of July 2, 1942.

The station has actually been on a war-time basis and program since early in April 1942. It has suffered a 30 percent reduction, over and above replacements and additions, in its permanent organization. Several new activities have been added and extension work through technical advice and guidance has been greatly increased. I know that the men and women

here at this station have worked hard and have done a good job. We hope that our effort has helped in the effective prosecution of the war effort.

Financing

Allotments to the station for F.Y. 1943 were $90,850 as compared with $105,950 for F.Y. 1942. This is a 14.3 percent reduction in funds. Though allotments for all of the financial projects except Forest Management were reduced, the cut was heaviest in Forest Survey (-28.6%) and Forest Products (-17.4%), the two major lines of research rated of highest priority in the war effort (April 1, 1942 - Summary Chart - Redirection of Research Activities). Station overhead was again reduced to keep pace with appropriation losses and was kept at 13.2 percent of the total.

The table which follows shows the reduction in funds and personnel during 1942 by financial projects.

Reduction in Allotments and Personnel During 1942.

| Division | ALLOTMENT | | Increase of Decrease: Percent | Reductions, 1943 over 1942 as of Jan. 1, 1942 and 1943 In Percent: No. of Personnel | Payroll in terms of salaries |
|---|---|---|---|---|---|
| | F.Y. 1942 | F.Y. 1943 | | | |
| Range Investigations | $ 33,100 | $ 30,100 | - 9.1 | - 10.0 | - 12.9 |
| Forest Survey | 35,000 | 25,000 | - 28.6 | - 50.0 | - 50.8 |
| Forest Management | 25,750 | 25,750 | -- | - 14.3 | - 29.2 |
| Forest Products | 12,100 | 10,000 | - 17.4 | -- | + 2.7 |
| Total Station | $105,950 | $ 90,850 | - 14.3 | - 29.7*/ | - 30.7* |

*/ Includes overhead which between January 5, 1942 and January 5, 1943 was reduced in number of personnel 50 percent and in payroll 34.6 percent.

It is interesting to note that the loss in personnel is in direct proportion to the loss in salary payroll (29.7 percent to 30.7 percent). This means that the loss in personnel was fairly well distributed through the high as well as the medium and low salaried positions. Such an orderly reduction in personnel was not due, however, to any scientific planning on our part here.

Recent checks on expenditures to date and estimates of last half of F.Y. 1943 expenditures indicate that there will be sufficient funds to carry out the reoriented program of research planned. A brief check, based on the best information available at present, indicates also that though it will be "nip and tuck" in certain divisions to take care of overtime obligations out of the present allotments, it can be done if required. It will mean subsidizing certain divisional funds to take care of others. The station has offered for turn-back some $2000 of the "restricted travel fund allowances." The station now has military furlough salary obligations

for the post-war period as follows:

| | |
|---|---|
| Forest Survey | $ 6,360.00 |
| Range Investigations | 3,400.00 |
| Forest Management | 5,840.00 |
| Station Overhead | 4,580.00 |
| Total | $20,180.00 |

These obligations must be kept in mind as they must be met in the post-war period.

Personnel

During the calendar year 1942, the station's personnel was reduced in number over and above replacements and additions by 30 percent. This should not be considered a serious situation in view of the $15,100 decrease (-14.3%) in allotments and the redirection of the station's research program to wartime needs. In some cases, entire work projects could not conscientiously be classed on anything higher than a maintenance basis. A number of minor projects and sub-phases of high priority projects had to be classed as non-urgent under the rating classification set-up. With some projects dropped for the duration and others put on a maintenance basis, certainly the stations would be expected to carry out the wartime program with less personnel and funds. More time and money is needed for active research than for maintenance.

The Branch of Research in its report to the Bureau of the Budget (Summary Table - Redirection of Research to Wartime Activities - April 1, 1942) classified the research work in progress as being 77 percent war,

8 percent post-war and 15 percent maintenance. Based on the financial and work projects underway at this station on January 1, 1942, and using the total funds expended in the table, work here would be classified as 73 percent war, 17 percent post-war and 10 percent maintenance. Actually, however, based on this station's recommendations and your office's approval or disapproval, a much higher percentage of the work here was placed on a post-war and maintenance basis. Practically all of the work in Silviculture, for example, was finally approved on a maintenance basis only. The same is true to a lesser extent in Range Investigations.

The table which follows shows by financial projects and positions the reductions in personnel, the cause of such reduction and the replacements and additions which took place in the organization at this station during the calendar year 1942.

## Losses and Replacements in Station Personnel During 1942

| Division | Station Personnel as of January 5, 1942 | | Reduction | Cause[1] | Number Replacements & Additions | Station Personnel as of January 5, 1943 | |
|---|---|---|---|---|---|---|---|
| | Position | No. | Number | T - Transfer<br>R - Resigned<br>F - Furloughed<br>MF - Military Fur. | | Position | No. |
| Overhead | Director | 1 | - | - | - | Director | 1 |
| | Jr. Adm. Asst. | 1 | 1 | 1-MF | - | - | - |
| | Clerk-Steno. | 2 | 2 | 1-MF, 1-R | 1 | Clerk-Steno. | 1 |
| | Total | 4 | 3 | 2-MF, 1-R | 1 | Total | 2 |
| Silviculture | Division Chief | 1 | 1 | 1-MF | [2] | - | [2] |
| | Asst. Proj. Leader | 1 | 1 | 1-F | - | - | - |
| | Supt. Exp. Forest | 1 | 1 | 1-R | 1 | Winter caretaker | 1 |
| | Technical Asst. | - | - | - | 1 | Technical Asst. | 1 |
| | Total | 3 | 3 | 1-MF, 1-F, 1-R | 2 | Total | 2[3] |

It will be noted that eight of the losses were due to transfers. Four of these were Winters, Hutchison, Hayes and Lemon transferred to your office or other stations at your request. Three others, all members of the Forest Survey organization, were transferred to the Region or Guayule project on June 30 because of a $10,000 decrease in funds for F.Y. 1943. The eighth case, Marie Bouchard, statistical clerk in the Division of Forest Products, transferred to the Guayule project by personal preference.

Two of the three resignations were to industry, one because of greater financial inducement, the other because of a Selective Service Board's order to either get into a war industry as a chemist or be drafted. The station cannot afford further losses in its permanent organization unless, of course, the next year's appropriations are materially reduced. It should not be called upon to transfer anyone to other stations except on an exchange basis. There is one exception, Paul Stickel. The station is ready to transfer, furlough or release him at any time. In this connection, you are referred to my letters of December 19, 1942 and January 30, 1943.

As far as the Selective Service Act is concerned, the men now left at the station are fairly safe from immediate call. The following table shows the Selective Service status of the men now in the organization:

| Men | Total No. | SELECTIVE SERVICE CLASSIFICATION BY NUMBER OF MEN | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Over 45 Years | 4-H over 38 Yrs. | 3-A Married no children | 3-A Married with dep. children | 3-B | 4-F | 1-A |
| Permanent | 17 | 4 | 3 | 1 1/ | 7 1/ | 1 2/ | 1 | -- |
| Temporary | 3 | - | - | 1 | - | - | 1 | 1 3/ |
| Total | 20 | 4 | 3 | 2 | 7 | 1 | 2 | 1 |

1/ Of the eight permanent personnel in 3-A, two are classed as project leaders, three as assistant project leaders, two as branch station superintendents and one as project worker.
2/ Classed 3-B voluntarily by his local board.
3/ Works for Range in summer, attends university in winter. Is 2nd Lieutenant in R.O.T.C.

The directive exempting men over 38 from active military service placed one of our project leaders (Kemp - Forest Survey) in the deferred classification. The men now classified as 3-A probably will not be called until late in the summer or fall of 1943. Most of them are registered in Montana, however, and the draft had already reached down through most of the married men without children last fall.

It is essential, from the standpoint of morale alone, that the question of the importance or unimportance of forest and range research to the war effort be ascertained and clarified as a basis for deferment. Under the present policy, only those men who spend more than 50 percent of their time on R(V) Products Supplies surveys or the Kok-saghyz emergency rubber project can be recommended to the Selective Service Boards for reclassification from 3-A to 3-B (deferred because of essential occupation) at this and probably all of the other stations. None of the old line research projects at the stations were included in the activities listed as of "direct aid to" or "in supporting" the war effort. Only two men at

this station would qualify under the above policy and they (Bradner and Whitney) are both over 45 years of age and now exempt from active military service. As test cases, I submitted letters of recommendation for deferment of Joe Woolfolk, project leader in charge of grazing management studies in the short-grass range type and the Kok-saghyz plantings at Miles City, and Paul Kamp, acting division chief in charge of the Forest Survey project and R(V) Products Supplies - Raw Materials Surveys, and these were not approved by your office. I selected these two cases because the grazing management studies at Miles City and the Forest Survey project were both classified as A-1 war projects. Neither man spent as much as 50 percent of his time on the new R(V) activities.

I understand, of course, that a new system of deferment is being worked out for Forest Service personnel, based on key positions in essential lines of work and approval is expected in the near future. There is no information here as to just what positions and what lines of work are to be considered essential as a basis for deferment. In the meantime, there is a feeling, hard sometimes to counteract, that the work of the experiment stations in contrast to that of the administrative branch or the Guayule project, has not been considered too essential to the war effort. People like to work on the emergency rubber project, for example, because it is aiding directly in the war emergency. Then, too, many forest officers in the administrative branch are considered essential to the war effort as they are employed on timber sales work or forest and range protection.

The Station Program

If the tables which follow are carefully reviewed, no detailed write-up of the station's program, accomplishments and plans is needed here. The tables show by financial and work projects the status of the work at the end of 1941, the recommendations made by the station in answer to Mr. Forsling's letter of February 25, 1932 for redirection of the research program to war-time activities, the approval or disapproval of these recommendations by your office, the accomplishments in 1942 and the plans for 1943. In addition, the accomplishments for 1942 and the plans for 1943 are tabulated for extension work (advice and guidance) and for the new activities taken on during the year.

It is felt that these tables will be useful in providing, all in one place, a brief summary and resume of the station's activities and plans.

M. BRADNER

DIRECTOR.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
NORTHERN ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

ADDRESS REPLY TO
DIRECTOR
AND REFER TO

FEDERAL BUILDING
MISSOULA, MONTANA

R - NRM
REPORTS
Station's Annual
1941

March 17, 1942

Dear Sir:

Because of the present national emergency this station is not preparing an annual report for general distribution. The attached status sheets for our projects will, however, inform you of the progress of our work, and our plans for the future.

Very truly yours,

M. BRADNER
Director

By Robert K. Winters Acting

Enclosure

U. S. DEPARTMENT OF AGRICULTURE

Forest Service

Northern Rocky Mountain Forest and Range Experiment Station

Missoula, Montana

# RESEARCH STATUS SHEETS FOR 1942

(Not for Publication)

# DIRECTORY OF PERSONNEL

## NORTHERN ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

January 5, 1942

### OVERHEAD ADMINISTRATION

| | |
|---|---|
| Melvin I. Bradner | Director |
| Mary J. Pershina | Jr. Administative Asst. |
| Dagmar Nelson | Senior Stenographer |
| Helen B. Davis | Asst. Clerk-Stenographer |

### FIELD STATIONS

| | |
|---|---|
| Deception Creek Experimental Forest | Elton E. Bentley |
| Priest River Experimental Forest | John D. Crowe |
| Miles City Experimental Range | E. Joseph Woolfolk |
| Vigilante Experimental Range | Grant A. Harris |

### DIVISION OF SILVICULTURE

| | |
|---|---|
| Charles A. Wellner | Asst. Silviculturist |
| Elton E. Bentley | Head Forest Guard |
| Donald G. McKeever | Junior Forester |

### DIVISION OF FOREST PROTECTION

| | |
|---|---|
| Harry T. Gisborne | Senior Silviculturist |
| Paul W. Stickel | Silviculturist |
| G. Lloyd Hayes | Assistant Forester |
| John D. Crowe | Jr. Agricultural Aid |

### DIVISION OF RANGE RESEARCH

| | |
|---|---|
| Leon C. Hurtt | Senior Range Examiner |
| Gordon D. Herrick | Assoc. Forest Ecologist |
| E. Joseph Woolfolk | Assoc. Forest Ecologist |
| Clark E. Holscher | Asst. Range Examiner |
| Grant A. Harris | Junior Range Examiner |
| Paul C. Lemon | Junior Range Examiner |
| W. Luther Norem | Jr. Plant Physiologist |
| Lester A. Keilman | Asst. Agricultural Aid |
| Anthony B. Evanko | Asst. Agricultural Aid |
| Henrietta A. Pissot | Jr. Clerk-Stenographer |

### DIVISION OF FOREST PRODUCTS

| | |
|---|---|
| Chester N. Whitney | Associate Forester |
| Marie E. Bouchard | Assistant Clerk |

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DIVISION OF FOREST SURVEY

| | |
|---|---|
| Robert K. Winters | Senior Forester |
| Paul D. Kemp | Assoc. Forest Economist |
| S. Blair Hutchison | Asst. Forest Economist |
| William L. Royer | Assistant Forester |
| Orlo B. Johnson | Agricultural Aid |
| Clarence W. Brown | Asst. Agricultural Aid |
| Melvin E. Metcalf | Asst. Agricultural Aid |
| Robert L. Conn | Jr. Agricultural Aid |
| John B. LaCasse | Statistical Draftsman |
| Eric G. Rutquist | Jr. Engineering Draftsman |
| W. Howard Welton | Jr. Engineering Draftsman |
| Henry J. Pissot | Asst. Statistical Clerk |
| Catherine M. Mead | Jr. Clerk-Stenographer |
| Helen I. Forney | Jr. Calculating Machine Operator |

FOREST BIOLOGY (in Cooperation with Fish & Wildlife Service)

| | |
|---|---|
| Forrest S. Romero | Jr. Biologist |

January 1942

# PUBLICATIONS

## I. PUBLISHED DURING 1941

### A. Departmental Bulletins and Circulars

Haig, I. T., Davis, K. P. and Weidman, R. H.
Natural regeneration in the western white pine type. Technical Bulletin no. 767. Gov't. Printing Office, Washington. May 1941.

Hayes, G. Lloyd.
Influence of altitude and aspect on daily variations in factors of forest-fire danger. Circular no. 591. Gov't. Printing Office, Washington. February 1941.

### B. Outside Publications

Bradner, M.
Redwood forest management for utilization. (Discussion on Emanuel Fritz' paper of above title.) Mechanical Engineering 63(5):388-389. May 1941.

Gisborne, H. T.
The new trend in fire control. Michigan Forester (Ann Arbor). pp. 16-18, 57. 1941.

Hurtt, L. C.
Restocking for northern Great Plains. The Montana Stockgrower, vol. 12, no. 9, p. 5. August 1941.

Rapraeger, E. F.
Did you know that.....Intermountain Logger (Third Intermountain Logging Conference), April 1941.

Rapraeger, E. F.
Frontier sawmill. The Timberman, vol. XLII, no. 7, May 1941.

Rapraeger, E. F.
Christmas tree industry in Montana. The Timberman, vol. XLIII, no. 2, December 1941.

Wellner, C. A.
Blister rust control in relation to white pine silviculture. Idaho Forester (Moscow), vol. 23, pp. 13-15. 1941.

Whitney, C. N.
Treating fence posts on the farm. The Montana Farmer, vol. 29, no. 1, September 15, 1941.

Winters, R. K.
The American Forest Survey. University of Washington Forest Club Quarterly, 14(2):14-20. 1941.

C. Multilithed and Mimeographed Progress Reports

Division of Forest Products
Wholesale lumber prices, fourth quarter, 1940. (Confidential - not for distribution.) Mimeog. January 1941.

Division of Forest Products
Wholesale lumber prices, first quarter, 1941. (Confidential - not for distribution.) Mimeog. May 1941.

Division of Forest Products
Monthly summary of business conditions in the lumber industry. Issued monthly, January-August 1941. Mimeog.

Division of Forest Products
Cedar products prices as of December 1, 1940. (Confidential - not for distribution.) Mimeog. January 1941.

Division of Forest Products
Lumber selling values since 1913. (Confidential - not for distribution.) Revised February 1941 to include 1940 figures. Mult.

Division of Forest Products
Stumpage transactions in the northern Rocky Mountain region in 1940. Mimeog. March 25, 1941.

Division of Forest Products
Review of cross-tie specifications as of April 15, 1941. Mimeog. April 1941.

Division of Forest Products
Amendments to review of cross-tie specifications issued April 15, 1941. Mimeog. October 15 and December 30, 1941.

Division of Forest Products
Lumber production by years in the northern Rocky Mountain region. Revised May 1941 to include 1940 figures. Mult.

Division of Forest Products
Preliminary 1940 log prices in the northern Rocky Mountain region. Research note no. 15. Mimeog. & mult. May 24, 1941.

Division of Forest Products
Cost of manufacturing lumber, exclusive of interest and discount, for Inland Empire sawmills during 1940. (Confidential - not for distribution.) Mult. July 1941.

Division of Forest Products
Directory of wood-preserving plants and secondary wood-using industries in the northern Rocky Mountain region. Mimeog. August 1941.

Division of Forest Products
Determining tree d.b.h. from stump measurements. Research note no. 16. Mimeog. & mult. September 5, 1941.

Gisborne, H. T.
Character of the 1940 fire season in Region One. Research note no. 3. Mimeog. February 1941.

Gisborne, H. T.
How the wind blows in the forest of northern Idaho. Progress report. Mimeog. 1941.

Norem, W. L.
Forest and range research in the northern Rocky Mountain region. Written as a section for the Region One clerks handbook. To be mimeographed.

Rapraeger, E. F.
Christmas tree production in western Montana in 1940. Research note no. 12. Mimeog. January 10, 1941.

Rapraeger, E. F.
Possibilities of wood-pulp production in the northern Rocky Mountain region. Station paper no. 4. Mimeog. March 1941.

Rapraeger, E. F.
Characteristics of some important commercial woods which are native to the northern Rocky Mountain region. Mult. May 1941.

Wellner, C. A. and Ralph Hansen
Volume distribution in ponderosa pine trees. Research note no. 17. Mult. November 1941.

January 1942

# GEOGRAPHIC STRAINS

FIELD DIVISION: Forest Management Research

WORK PROJECT: Genetics

LINE PROJECT: Racial Variation (geographic strains of ponderosa pine)

PURPOSE OF WORK: To determine suitability of ponderosa pine seed from different sources for planting in northern Idaho; to ascertain heritable characteristics of growth, form, and hardiness developed through adjustment of parents to local climate.

REVIEW OF PAST WORK: Trees grown from seed of ponderosa pine collected in 21 widely separated localities in western United States were planted in plots at the Priest River Experimental Forest from 1911 to 1917. Plots studied and reported upon by Kempff in 1927. Thorough field examination and measurements made in fall of 1935 and analysis made by Weidman. Differences with respect to number of needles to the fascicle, length of needles, general appearance of foliage, and thickening of hypoderm found among progeny groups derived from different regions delimited on the basis of precipitation type. Persistence of needles found not to be hereditary. Pronounced differences found among different progenies in height growth, diameter growth, relation of two, and relative height growth by years. Best growth in height and diameter made by trees derived from localities which in climate resemble locality of planting site. As sources of seed for planting in northern Idaho, experiment indicates trees of North Pacific region unsuitable because of low frost resistance, those of Black Hills and southeastern Montana questionably suitable because of early decline in growth rate, those of Central and South Plateaus and Colorado decidedly unsuitable because of distinctly poor rate of growth. Findings to date indicate most suitable general territory in which to collect ponderosa pine seed for northern Idaho use extends from Colville locality in Washington eastward a little beyond Continental Divide and from Salmon River to Canadian boundary. Manuscript "Evidences of Racial Influence in a 25-Year Test of Ponderosa Pine" by R. H. Weidman published in the Journal of Agricultural Research, volume 59, number 12.

ACCOMPLISHMENTS DURING PAST YEAR: None.

PLANS FOR 1942: None.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT:

January 1942

# STAND STUDIES - WESTERN WHITE PINE

FIELD DIVISION: Forest Management Research

WORK PROJECT: Mensuration

LINE PROJECT: Stand Studies (Western White Pine Type)

PURPOSE OF WORK: To determine composition, growth, mortality, and yield in western white pine stands.

REVIEW OF PAST WORK: 1. Type-wide study of growth and yield in fully stocked natural stands. (Published as U. S. Department Agriculture technical bulletin 323.)

2. Establishment and period remeasurement of 34 permanent and 54 semipermanent yield plots in natural stands.

3. Increment and mortality observations of residual stand on 24 permanent plots in cutover, mature, and overmature stands. Ten-year records for nine of these plots showed a consistent loss of the residual stand in net volume amounting to 20 percent the first decade, substantiating the observation that old white pine stands have a tendency to deteriorate following a heavy partial cutting.

4. Type-wide study of increment and mortality in cut-over stands using temporary plot technique. Field work done in 1928, 1937, and completed in 1938. Compilation of data completed. Project now ready for final analysis and report writing.

ACCOMPLISHMENTS DURING PAST YEAR: Remeasurement of 6 permanent plots in cutover stands.

PLANS FOR 1942: Remeasurement of 9 permanent yield plots in natural stands and 10 permanent plots in cutover stands.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT: C. A. Wellner.

January 1942

# STAND STUDIES - PONDEROSA PINE

FIELD DIVISION: Forest Management Research

WORK PROJECT: Mensuration

LINE PROJECT: Stand Studies (Ponderosa Pine Type)

PURPOSE OF WORK: To determine composition, growth, mortality, and yield of stands of the ponderosa pine type.

REVIEW OF PAST WORK: A total of 186 temporary yield plots established in even-aged stand during the period 1932-34 as part of an interregional growth study. Data turned over to the Pacific Northwest Station which prepared technical bulletin no. 630, "Yield of Even-Aged Stands of Ponderosa Pine" in 1938. About 110 of temporary plots selected for remeasurement as semipermanent yield plots. Six permanent yield plots in Lolo National Forest measured periodically.

ACCOMPLISHMENTS DURING PAST YEAR: None.

PLANS FOR 1942: None.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT:

January 1942

# STAND STUDIES - LARCH-DOUGLAS-FIR

FIELD DIVISION: Forest Management Research

WORK PROJECT: Mensuration

LINE PROJECT: Stand Studies (Western Larch-Douglas-Fir Type)

PURPOSE OF WORK: To determine composition, growth, mortality, and yield of stands of the western larch-Douglas-fir type.

REVIEW OF PAST WORK: 1. Measurement of increment and mortality 25-35 years after cutting on 86 temporary plots in selectively cut stands. Most of office compilations made and preliminary report prepared. Final report for publication yet to be prepared.

2. Four permanent yield plots established during last 25 years in fully stocked natural stands.

3. Yield study of even-aged stands made by forest survey taking data on 150 temporary plots. Of these 42 have been selected for remeasurement as semipermanent yield plots.

ACCOMPLISHMENTS DURING PAST YEAR: Two permanent yield plots remeasured.

PLANS FOR 1942: None.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT:

January 1942

# PLANTING

FIELD DIVISION: Forest Management Research

WORK PROJECT: Regeneration

LINE PROJECT: Planting

PURPOSE OF WORK: To develop methods of artificial regeneration which are economically and silviculturally satisfactory.

REVIEW OF PAST WORK: Investigative work in planting and nursery practice started with the establishment of the Priest River Station in 1911 and continued intermittently until 1926. Nursery studies in seedbed densities, season of sowing, and root pruning reported in numerous publications have contributed much to the development of nursery practice. Studies in direct seeding conducted between 1915 and 1921 did not develop a successful method. Results of planting investigations contributed to the development of a successful planting technique and indicated that season of planting had no appreciable effect on survival and that transplant stock was better than seedling stock. An analysis of plantation survival records, 1910-1936, inclusive, showed that spring-planted stock survived better than fall-planted stock and that average survival 10 years after planting was only 42 percent. To determine where improvements in planting practice might be made, investigations were resumed in 1936. A 5-year study of grade and age, class of stock, carefulness in planting and handling stock, and early, middle, and late spring planting was started, with the station and the regional office cooperating, and has been continued by the planting office with occasional help and advice from the station. Since 1937 the station has concentrated its efforts on investigations of direct seeding. Results of this work are as follows: (1) Western white pine, ponderosa pine, and Douglas-fir were successfully seeded on selected sites when protected from rodents. (2) In several large-scale trials satisfactory rodent control was obtained using a poisoning method developed by the Fish & Wildlife Service. (3) Fall sowing was superior to spring sowing. (4) Cultivation of ground prior to sowing on recent burns had no effect on germination and survival. (5) Sowing in prepared spots was cheaper than broadcast sowing. (6) Seeding promises to cost considerably less than planting. (7) Western redcedar and Engelmann spruce, both small-seeded species, were successfully seeded on selected sites without rodent protection.

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ACCOMPLISHMENTS DURING PAST YEAR: The direct-seeding project received an impetus during 1941 with the assignment to the station of a Junior Biologist, Forrest S. Romero, by the Fish & Wildlife Service. The project also received a very severe setback with the loss of funds for its continuation. The station has been forced to drop the junior forester assigned to the work; future participation by the station will have to be at the expense of other projects.

No new tests were made during 1941; work consisted of observing results of established tests and bringing project completely up to date so far as analysis of data and preparation of results for publication are concerned. McKeever prepared three progress reports to be issued as station research notes and Schopmeyer prepared a manuscript summing up results of the project to date for publication as a circular. Continued observation of established tests showed the following: 1. Results prove that large-scale seeding of white pine on selected sites can be a successful, practical, and economical method of establishing reproduction. Additional cost data for this species indicate that seeding can be done for from 55 to 75 percent of planting costs. 2. On a large-scale test of ponderosa pine, poisons apparently controlled rodents but seeding was a failure because of grasshopper damage. 3. Both redcedar and Engelmann spruce, especially redcedar, are exceedingly exacting in their site requirements. Seeding of redcedar in brush may be possible only in more favorable years.

PLANS FOR 1942: Cooperate with Administration and Junior Biologist of Fish & Wildlife Service in: 1. Remeasurement of established seeding tests; 2. testing various methods of rodent control.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT: C. A. Wellner,
Forrest S. Romero (Fish & Wildlife Service).

January 1942

# HARVEST CUTTINGS - WESTERN WHITE PINE

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Harvest Cuttings (Western White Pine Type)

PURPOSE OF WORK: To develop methods of cutting through investigation of controlling factors that will result in adequate natural regeneration of desired species.

REVIEW OF PAST WORK: Much of the station's silvicultural research program since its beginning has centered around methods of cutting and natural regeneration. Various studies of cutting methods, seed supply, seed germination, initial survival, establishment, and early development have been made and reported upon from time to time in numerous publications and station manuscripts. The results of most of these studies have been brought together in comprehensive fashion in "Natural Regeneration in the Western White Pine Type," U. S. Department Agriculture technical bulletin no. 767. With the publication of this bulletin, several of these studies were closed and the way cleared for new investigations. A recent study of the economics of managing western white pine forests, begun in 1938 and the results now in manuscript form awaiting publication as a departmental bulletin, has contributed materially in providing an economic evaluation of various silvicultural practices and methods. Recent work has also included studies, nearing completion, of stand development during the early and formative years. In cooperation with other agencies, a preliminary study of root diseases in white pine was completed in 1938 and a report of results issued as station paper number 1. A cooperative report was prepared in 1940 on blister rust control in the management of western white pine. Most recent studies have been concerned mainly with the possibilities of partial cuttings in western white pine stands. Studies of light cuttings in immature stands were begun in 1937 in cooperation with Administration and the Division of Forest Products. Studies of light cuttings in mature stands to harvest defective and poor vigor trees were begun as a cooperative study in 1939 with trial cuttings on the Deception Creek Experimental Forest. These were continued during 1940 with considerable promise of success.

ACCOMPLISHMENTS DURING PAST YEAR: 1. Manuscript of "show-me" booklet for Priest River Forest nearly completed. 2. Limited cooperation given Administrative organization of Forest Service and Dr. Ehrlich of University of Idaho in a study of mortality in young white pine stands. 3. Continued cooperation with blister rust

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control organization. Article published on relation of blister rust control to silvicultural practice. 4. Studies of partial cuttings in stands of white pine type continued and expanded in cooperation with Administration and Bureau of Entomology & Plant Quarantine as follows: (a) Light cuttings of defective and poor vigor trees continued in 160-year-old stands on Deception Creek Forest. Four sample plots established to study intensively the effectiveness of the cuttings. (b) An administrative partial cutting in 110-year-old stand on Rapid Lightning Creek of Kaniksu Forest was utilized to study intensively partial cuttings of two intensities. (c) Partial cutting of white pine by private operators in immature stands of the St. Joe region examined and office report prepared, pointing out danger of such cuttings in reducing growing stock.

PLANS FOR 1942: 1. Prepare paper summarizing all data on early stand development in the western white pine type. 2. Complete "show-me" booklet for Priest River Forest. 3. Continue cooperation with blister rust control organization in developing guides for determining priority of areas for control work. 4. Continue studies of partial cuttings in western white pine stands in cooperation with Administration and Bureau of Entomology & Plant Quarantine as follows: (a) Continue light cuttings on Deception Creek Forest and establish two plots to determine effectiveness of cuttings. (b) Complete establishment of three plots on Rapid Lightning Creek. (c) Prepare working plan for and carry out studies of extensive light cuttings of defective and poor vigor trees in stands 100-130 years of age in Yellow Dog and Downey Creeks of Coeur d'Alene Forest. (d) Remeasure Bear Paw light cutting in 65-year stand, and establish check plot, if possible, for this cutting. (e) If time permits, establish series of three light-cutting plots in young stands on St. Joe Forest.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT: C. A. Wellner and E. E. Bentley.

January 1942

# PHENOLOGY

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Silvics (Phenology)

PURPOSE OF WORK: To determine seasonal vegetative events of principal trees and shrubs in Region One.

REVIEW OF PAST WORK: Project started in 1928 with phenological observations made by rangers on 18 national forests, at Savenac Nursery, Priest River Experimental Forest, Yellowstone and Glacier National Parks. Observations dropped on 12 forests between 1932 and 1934. At the beginning of 1937 observations were being made at only nine stations. Project terminated in 1937 because the station found it impossible to give adequate technical supervision. Although a large mass of information has been collected, its usefulness is greatly limited by lack of uniformity and thoroughness in making observations. Compilation of the data and preparation of a report summarizing useful information remains to be done.

ACCOMPLISHMENTS DURING PAST YEAR: None.

PLANS FOR 1942: None.

DATE OF COMPLETION: Project terminated except for preparation of final report.

ASSIGNMENT:

January 1942

# STAND IMPROVEMENT - WESTERN WHITE PINE

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Stand Improvement (Western White Pine Type)

PURPOSE OF WORK: To develop cultural measures which will improve the quality and growth of immature stands.

REVIEW OF PAST WORK: Studies of intermediate cuttings were begun in 1914 with the establishment of a series of thinning plots. Work was continued in a more or less desultory fashion until 1933 when, with establishment of the Deception Creek Experimental Forest and availability of emergency funds, a moderate program of stand improvement was undertaken. Fairly extensive work was also done by the administrative organization. In 1936 available information on stand improvement practices was assembled in a mimeographed manual, "Stand Improvement Practice in the Western White Pine Type," and accepted by Administration as standard instructions for this class of work.

In 1938, in cooperation with Region One, a rather comprehensive summary of stand improvement work done in both western white pine and ponderosa pine was made. All information available, plus additional silvicultural data obtained in the field, was systematically assembled in unit reports and a brief summary of results was prepared.

A series of extensive thinnings in replicated strips, mainly to release western redcedar, have been made in the Priest River Experimental Forest. Extensive cleaning to free white pine from larch established in replicated strips adjacent to Deception Creek Experimental Forest.

Periodic remeasurements are made on the following: 20 permanent plots in young stands of less than pole size, 39 permanent plots in pole-sized stands (one of these is a subplot latin square), 4 girdling plots, and 11 small pruning plots. Results to date indicate that thinnings and improvement cuttings in pole stands should be applied with caution at the present time. Although such cuttings usually result in accelerated growth on selected trees, this may be outweighed by damage from snow and sunscald. Benefits are often outweighed also by treatment costs. Stand improvement measures offering the most promise at the present time are cleanings to release white pine (see station research note number 4, March 1940) and pruning of young white pine.

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The present need in this field is to round out the experimental program to test various stand improvement measures and to bring results to date together as a guide for post-war activities.

ACCOMPLISHMENTS DURING PAST YEAR: 1. Progress report prepared covering 15-year results of Borggreve thinning made in 1925 on Priest River Forest. Results point out danger of depleting the growing stock when thinning from above in immature western white pine stands. Results especially timely as present demand for pine is forcing operators into young stands where cutting amounts to a Borggreve thinning. 2. Continued extensive stand improvement work consisting of thinnings and improvement cuttings in pole stands on the Priest River Experimental Forest.

PLANS FOR 1942: 1. Prepare and issue station research note based on 15-year progress report of Borggreve thinnings. 2. Re-examine 11 small pruning plots.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT: C. A. Wellner.

January 1942

# STAND IMPROVEMENT - PONDEROSA PINE

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Stand Improvement (Ponderosa Pine Type)

PURPOSE OF WORK: To develop cultural measures which will improve the quality and growth of immature stands.

REVIEW OF PAST WORK: 1. Twelve plots to test different weights of thinning established on the Lolo National Forest during 1933 in a 50-year-old ponderosa pine stand. Fifth-year remeasurement of these plots showed that ponderosa pine responds well to thinning. Greatest response was obtained in heavily thinned plots. Results, shown by fifth-year remeasurement, summarized and issued as station research note number 3.

2. Three additional thinning plots established on the Lolo National Forest in a 30-year-old stand during 1935.

3. Extensive test of pruning ponderosa pine made on more than 300 acres in the Priest River Experimental Forest.

4. A small plot to determine the relationship between pruning and subsequent infection established on the Priest River Experimental Forest during 1940.

ACCOMPLISHMENTS DURING PAST YEAR: Progress report prepared, summarizing results of the fifth-year remeasurement of the three Lolo plots.

PLANS FOR 1942: Progress report on the fifth-year remeasurement of the three Lolo plots to be issued as a station research note.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT: C. A. Wellner.

January 1942

# BEHAVIOR OF FIRES

FIELD DIVISION: Forest Management

WORK PROJECT: Fire Protection

LINE PROJECT: Behavior. Daily and Seasonal Variables.

PURPOSE OF WORK: To determine the relation between meteorological elements and inflammability of the fuels of forest fires, including the factors of inflammability and how each may best be measured. Involves (1) what to measure; (2) how to measure; (3) where to measure; (4) when to measure; and (5) how to integrate these measurements into a practical scale of inflammability and fire danger.

REVIEW OF PAST WORK: Started in 1922. Five most essential factors selected. Three new instruments invented. Integrating meter developed through five models in 10 years. Two major bulletins and several articles published describing methods.

Four seasons' work on one factor, vegetative inflammability, not conclusive. Five seasons on where to measure by Altitude and Aspect have uncovered some unsuspected and much usable information.

ACCOMPLISHMENTS DURING PAST YEAR: Field application of fire danger measurement methods studied at 41 ranger stations, 20 lookout stations, and 10 supervisors' offices revealing best consistency and accuracy of measurement yet attained in this region. Several ideas obtained for improving present practices, some immediately applicable, some requiring further research. Occurrence of an easy fire season provided long-awaited data which now permits closing study of effect of timber canopy. U. S. Department of Agriculture circular 591, "Influence of Altitude and Aspect on Daily Variations in Factors of Forest Fire Danger" by G. Lloyd Hayes published February 1941. "How the Wind Blows" by H. T. Gisborne multilithed June 1941.

PLANS FOR 1942: Reduce field work to least possible, first to complete compilation and reporting on past field work not yet analyzed; second, to reduce expenses. Revise model 5 danger meter in accordance with (1) experience of past several years, (2) Washington requirement of danger measurement on a scale of 0 to 100. Prepare report on 11 seasons of fire danger factors under full sun, half sun, and full shade, completing this study of effect of timber canopy on factors of fire danger. Revise 20-year summary of meteorological data for Priest River Experimental Forest to include the last 10 years for a total of 30 years.

DATE OF COMPLETION: Unknown.

ASSIGNMENT:
H. T. Gisborne - Danger Measurement
G. L. Hayes - Altitude and Aspect
P. W. Stickel - Effect of Timber Canopy

January 1942

## PRESUPPRESSION, DETECTION, SUPPRESSION

FIELD DIVISION: Forest Management

WORK PROJECT: Fire Protection

LINE PROJECT: Control. Fire Control Planning.

PURPOSE OF WORK: To determine the principles, methods, and procedures that will furnish adequate man-power and facilities for fire control at least cost in accordance with local values at stake, occurrence of fires, and fuel types.

REVIEW OF PAST WORK: Systematic, methodical evaluation of all factors most essential to planning for adequate fire control at least possible cost was pioneered in the United States by the late Lloyd G. Hornby of this station from 1931 to 1935. Limited issue of mimeographed copies of his report was soon exhausted. Requests had to be refused from 28 individuals in 1937, 8 in 1938, 5 in 1939, 1 in 1940, and 2 in 1941. Satisfactory classification of fuels has been major factor needing research. Lyman obtained useful data in 1938-1940 on 74 fires representing three rate-of-spread types under five different classes of danger. In 51 cases the data apply also to resistance to control. These are not adequate even when supplemented by information from several thousand fire reports.

ACCOMPLISHMENTS DURING PAST YEAR: An easy fire season failed to provide any fires that could be reached in time for study. Six test fires were set and measured by Stickel, who also commenced analysis of the regional fire records for 1939 and 1940 to determine rates of spread of fire by fuel types and by class of day. Detailed work plan for rate-of-spread study practically finished.

PLANS FOR 1942: Total lack of funds for field assistants on going fires and almost total lack of help from CCC camps will prevent any field work on rate of spread, resistance to control, and fuel type classification. Finish progress report and working plan on this phase. If Assistant Supervisor Sutliff can be detailed to work with Gisborne, prepare a revision of Hornby's Progress Report Number 1, on fire control planning, incorporating improvements developed by regional office since 1936 for publication in form to meet continuing demand.

DATE OF COMPLETION: Unknown.

ASSIGNMENT: H. T. Gisborne - Fire Control Planning
P. W. Stickel - Fuel Types.

January 1942

# ECONOMICS OF FIRE CONTROL

FIELD DIVISION: Forest Management

WORK PROJECT: Fire Protection

LINE PROJECT: Economics

PURPOSE OF WORK: Fire control is intended to serve all phases of forestry, the production of timber, livestock, wildlife, recreation, and water. Intensity of fire control suited to one product may be unjustifiably expensive or entirely inadequate for a different product. Control for multiple use or many products may be determined by only one product, the most damageable. Adequate control at least possible cost definitely depends upon these economic objectives, and fire may benefit one product while it damages another. Under this concept "adequate control" has never yet been defined, even though the term is frequently used in Federal and State regulations and even laws.

Practically no research work has been done in this field for the past 10 or 15 years. As many economic concepts have changed radically during this period, some exploratory work is urgently needed.

REVIEW OF PAST WORK: None at this station. Gisborne's "Analysis of the Forest Fire Problem in Regions I, II, III, and IV," dated May 30, 1941, merely stresses the need.

ACCOMPLISHMENTS DURING PAST YEAR: Priest River Fire Conference recognized the urgency of exploratory work and the desirability of establishing economics as a separate phase of the fire problem.

PLANS FOR 1942: Commence identification, description, and classification of types of economic knowledge needed by fire research. In conjunction with field work needed to rewrite the Fire Problem Analysis for Regions I to IV, Gisborne should visit Regions II, III, and IV, the first two being completely foreign to him. Local discussions of various features of the fire problem can be extended to include exploration of the economic phase.

DATE OF COMPLETION: 1960-65.

ASSIGNMENT: H. T. Gisborne under direction of Alf Z. Nelson.

January 1942

# MANUFACTURING COST STATISTICS

FIELD DIVISION: Forest Products

WORK PROJECT: Forest Products Statistics

LINE PROJECT: Manufacturing Cost Statistics - Logs and Lumber

PURPOSE OF WORK: To obtain detailed logging and lumber manufacturing costs from the larger lumber companies in western Montana, northern Idaho, and eastern Washington by personal contact. The information is confidential and is used in appraising national forest timber and in logging and milling studies.

REVIEW OF PAST WORK: Detailed lumber production costs are now available from 1916 to 1940, inclusive. This is probably the most complete series available in the United States.

ACCOMPLISHMENTS DURING PAST YEAR: Costs for 1940 were obtained as usual from 22 of the bandmills in the region. These mills have about 80 percent of the region's sawmill capacity.

PLANS FOR 1942: Obtain the costs for 1941 and continue the project.

DATE OF COMPLETION: Continuing indefinitely.

ASSIGNMENT: M. Bradner and P. Neff, Regional Logging Engineer - Field Work. Marie Bouchard - Office Compilation.

January 1942

# PRODUCTION STATISTICS - LUMBER AND OTHER PRODUCTS

FIELD DIVISION: Forest Products

WORK PROJECT: Forest Products Statistics

LINE PROJECT: Production Statistics

PURPOSE OF WORK: (1) To obtain statistics showing the production of lumber and other timber products in Montana, Idaho, and northeastern Washington in cooperation with the Bureau of the Census, Department of Commerce. (2) To obtain statistics showing the production of Christmas trees in western Montana.

REVIEW OF PAST WORK: As a result of work done by this station in the past, lumber production data from 1906 to the present time have been made available to the public. Figures on the production of Christmas trees are available from 1937 to date. In 1940, a pamphlet, "Highlights of the Lumber Industry," was issued. This publication was based to a considerable extent on forest products statistics collected by the division.

ACCOMPLISHMENTS DURING PAST YEAR: The lumber census was completed on May 15, when preliminary figures were issued. A total of 589 active concerns were canvassed, including 146 firms in South Idaho. Figures on Christmas tree production were obtained as usual. The number cut in western Montana in 1940 was 2,338,350 trees compared with 1,967,350 in 1939.

PLANS FOR 1942: Continue the project.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT: C. N. Whitney,
Marie Bouchard.

January 1942

## SELLING VALUE STATISTICS - LUMBER AND OTHER PRODUCTS

FIELD DIVISION: Forest Products

WORK PROJECT: Forest Products Statistics

LINE PROJECT: Selling Price Statistics

PURPOSE OF WORK: To collect and present in usable form lumber and timber products price statistics for eastern Washington, northern Idaho, and Montana in sufficient volume to indicate periodic trends in selling price of lumber (wholesale and retail), stumpage, logs, cedar products, and ties. These data are used in appraising the stumpage value of timber sold from Forest Service lands and for other purposes.

REVIEW OF PAST WORK: Publications now available show: (1) Stumpage prices by species for each year since 1912; (2) average annual wholesale lumber selling prices for the commercially important species of the Inland Empire for each year from 1913 to 1940; and (3) log prices since 1938. In addition, unpublished records are available which show the selling price of (1) sawlogs, 1912 to 1937; (2) cedar posts and poles, 1923 to date; (3) railway ties, 1920 to date; and (4) retail lumber, 1922 to date.

ACCOMPLISHMENTS DURING PAST YEAR: The publication showing stumpage prices was revised to include 1940 figures, and, in addition, an article pertaining to log prices was distributed. On March 31, 1941, the Western Pine Association canceled the contract under which data used by the division in compiling the quarterly and annual reports on wholesale lumber selling prices, issued since 1913, had been previously obtained. As a result, a report of the wholesale selling price of lumber of different species, grades, and sizes, and quantities sold during the first quarter of 1941, was the only one compiled. During the rest of the year, the weekly prices still received from the Pine Association were used to some extent for timber appraisal purposes. The selling price statistics of cedar products, ties, and retail sales of lumber were kept up to date.

PLANS FOR 1942: Compile wholesale selling prices of lumber contained in weekly reports by the Western Pine Association, or those obtained from other sources in collaboration with P. Neff, Regional Logging Engineer. With the possible exception of the retail lumber price compilation, which may be dropped, continue the various other compilations.

DATE OF COMPLETION: Continuing indefinitely.

ASSIGNMENT: C. N. Whitney - Stumpage and Log Prices
Marie Bouchard - All Other.

January 1942

# LOGGING AND MILLING INVESTIGATIONS

FIELD DIVISION: Forest Products

WORK PROJECT: Timber Harvesting and Conversion Investigations

LINE PROJECT: Logging and Milling

PURPOSE OF WORK: The work divides into three parts: (1) Combination woods-and-mill studies which provide information on the quantity, grade, and value of lumber produced by trees of different sizes and grades, the cost of producing the lumber, and the size and grade of tree which it is profitable to utilize. (2) Woods studies which provide information on logging outputs and utilization. (3) Sawmill and manufacturing-plant studies which supply information on overrun, grades of lumber produced by logs of different sizes and grades, the cost of sawing, the efficiency of various plant machinery, the waste occurring in manufacture, etc.

REVIEW OF PAST WORK: Publications now available show diameter cutting limits and other information necessary to selective logging in the (1) western white pine type, (2) ponderosa pine type, and (3) larch-Douglas-fir type. Log and tree grades have been developed locally to facilitate application of the principles deduced from the studies. Also, numerous logging output and "residual wood left after logging" studies have been made in important forest types. In the sawmill, studies conducted during the past 15 years have made available information on the average overrun of lumber over log scale for all commercial species, quantitative and qualitative waste, and the volume and value losses in fire-damaged timber, river-driven logs, and logs transported over gravity chutes.

In 1937 light cuts were made in 64-year-old white pine on the Kaniksu National Forest. A publication telling about the possibilities of partial cuts in young white pine stands was distributed in 1940. Operators became interested and as a result the Kaniksu made two small commercial sales in similar age classes. In 1939 and 1940 light cuts, taking 25 percent of the total stand, were made in 160- to 180-year age classes on the Deception Creek Experimental Forest. The trees marked for cutting were of low vigor, very defective, and otherwise deteriorating. Some of the timber cut in 1939 was studied in the sawmill to determine the grades of lumber which it yielded. No additional field work was done on this study in 1941. However, computations to be handled by the Division of Forest Products are fairly well along and will be completed.

During 1940 considerable progress was made on a study to determine the relative merits of square versus round timbers for underground use in Montana's metal mines, especially in the Butte mining district.

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ACCOMPLISHMENTS DURING PAST YEAR: Completed study of square versus round mining timbers. A manuscript prepared by E. F. Rapraeger for a proposed trade journal article covers the results of this study. The information presented reveals that for many years mine operators in the Butte district have used timbers in the round whenever practicable for the sake of economy. In other words, a cubic foot of round material of suitable size could be produced more cheaply than a cubic foot of sawed material. Based on conditions as they existed in 1939-40 in Montana, the cost of round material is just about half the cost of square and to substitute sawed material would double the timber bill. At the present time round timbers are used almost exclusively in stopes and in most crosscuts and drifts. Large sawed timbers are used in shafts, at pumping stations and other permanent rooms where a better class of timbering is desired than is possible with round material. Much of this sawed material is treated with preservatives to assure greater permanency. Sawed timber is also used for mine ties, for lagging, for bricking up, and for other special purposes.

PLANS FOR 1942: No new work contemplated. Compilation of data from the utilization study made in 1939 at the sawmill of the Ohio Match Company, Huetter, Idaho, will be completed. The timber studied came from a lightly cut stand of 160- to 180-year-old white pine on the Deception Creek Experimental Forest. Continue to work on the utilization end of partial cutting studies in the western white pine type.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT:

_____ - Project Work
Marie Bouchard - Office Compilation.

January 1942

# PROPERTIES AND USES OF MINOR SPECIES AND PRODUCTS

FIELD DIVISION: Forest Products

WORK PROJECT: Timber Harvesting and Conversion Investigations

LINE PROJECT: Properties and uses of the little-used species and the properties and uses of products other than lumber.

PURPOSE OF WORK: To provide information on the available supply, quality, and suitability for specific uses of the little-used species (western larch, Douglas-fir, Engelmann spruce, lodgepole pine, western redcedar) and the properties and uses of forest products other than lumber.

REVIEW OF PAST WORK: Departmental bulletins have been published on western larch and white fir, respectively, and a pamphlet was distributed which dealt with the utilization of Montana forests for Christmas trees. Prior to 1933 about half the work necessary for a bulletin on lodgepole pine had been done when the urgency of other work compelled temporary suspension of activity.

In 1940 tests were made of the suitability of western larch for plywood. Cooperators were the Anaconda Copper Mining Company, the Milwaukee Railroad, and the Forest Products Laboratory. A start was made on a study dealing with the possibilities of establishing pulp mills in Montana.

ACCOMPLISHMENTS DURING PAST YEAR: A very comprehensive report pertaining to the possibilities of wood-pulp production in the northern Rocky Mountain region was prepared and issued as a station paper. Since it became apparent that more tests of the suitability of Engelmann spruce for wood pulp were needed, the division sent two cords of spruce from the Flathead National Forest to the Forest Products Laboratory at Madison, Wisconsin, for testing. The Great Northern Railway Company cooperated by furnishing transportation free of charge between Montana and Minneapolis, its eastern terminal. Laboratory tests covering the physical and chemical properties of the spruce in this sample shipment have been completed and in December the pulping tests were under way.

The possibility of laminating mine guides, to be made of western larch, and using them as a substitute for solid timber was briefly investigated in cooperation with the Anaconda Copper Mining Company. The company furnished the material, which was glued in Seattle, shipped back to Missoula, and tested for strength in the University of Montana testing machine by E. F. Rapraeger and Professor J. H. Ramskill.

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These strength tests proved that the glue used was unsatisfactory. The Anaconda Copper Mining Company is still interested in this proposition and may desire to have additional tests made.

PLANS FOR 1942: Prepare article on lodgepole pine for trade journal publication. Follow up work on suitability of western larch for plywood and the use of larch for laminated mine guides. Continue work on wood pulp production possibilities in the northern Rocky Mountain region. Continue to study the suitability of little-used species as a substitute for metal in defense activities.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT: _____ - Project Work
C. N. Whitney - Lodgepole Pine Study.

January 1942

# DURABILITY OF WOOD - TREATED AND UNTREATED

FIELD DIVISION: Forest Products

WORK PROJECT: Wood Preservation Investigations

LINE PROJECT: Service Test Records

PURPOSE OF WORK: To provide information on: (1) The durability of treated and untreated telephone poles, fence posts, ties, and other timbers produced from timber trees native to the northern Rocky Mountain region; and (2) the comparative value of various wood preservatives and treating processes.

REVIEW OF PAST WORK: Periodic examinations of wood used in various forms have been made since 1910 on about 40 installations, which include telephone and power pole lines, fence posts, mine timbers, and ties. Many progress reports and several publications presenting the results of these studies have been prepared. Treating instructions promulgated by the division in 1926, and revised at various intervals during the past 15 years, have been applied in the treatment of telephone poles, stubs, and fence posts used in Forest Service construction and maintenance work throughout the region. A handbook containing the latest revision of these instructions was distributed in 1939.

ACCOMPLISHMENTS DURING PAST YEAR: Eleven inspections of experimental timbers of various kinds were made. Reports or tables covering all of these installations were prepared. The following formal reports and articles for publication were completed:

1. "Treating Fence Posts on the Farm." Published in The Montana Farmer, September 1941.

2. "Results to Date of Studies of the Durability of Native Woods, Treated and Untreated." Issued as a station paper, September 1941.

3. "Report on Northern Pacific Test Tracks at Plains, Thompson Falls, Missoula, and Lolo, Montana." Sent to A. J. Loom, chairman of A.W.P.A. and A.R.E.A. committees on tie service records, December 1941.

At the beginning of the year the project included 15 installations, but through the completion of a study of untreated western redcedar electrification poles, conducted in cooperation with the Chicago, Milwaukee, St. Paul & Pacific Railroad Company, that number was reduced to 14 during the year.

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PLANS FOR 1942: (1) Inspect the following installations: Three railway-tie test tracks, two fence post tests, and one telephone line. Prepare tables or reports covering the results of these inspections. (2) Conduct one new treating experiment on nine native species, the object being to determine penetrations in sapwood and heartwood by open-tank methods in comparison with those obtainable by pressure treatments, using matched pieces of each wood under controlled conditions. It is expected that this test will also yield some information as to the rate of absorption of the heartwood and sapwood of different species when they are all in the same tank. The material for this experiment was collected in June 1941. (3) Prepare a trade journal article on the treatability and service life of native woods.

DATE OF COMPLETION: Irregular intervals when no longer useful.

ASSIGNMENT: C. N. Whitney.

January 1942

# INVENTORY PHASE OF FOREST SURVEY

FIELD DIVISION: Forest Survey

WORK PROJECT: Forest Survey

LINE PROJECT: 1. Inventory Phase of Forest Survey in the Northern Rocky Mountain Region.

PURPOSE OF WORK: A comprehensive inventory of the forests of this region as part of the forest survey of the nation.

REVIEW OF PAST WORK: Field work on this project was started in 1932 and office compilation work in 1935. Up to January 1, 1941, 29.5 million acres of forest and nonforest land had been covered by the field survey; inventory field statistics had been compiled for 21.6 million acres of forest land, 25.9 million acres of forest and nonforest land. The inventory progress by calendar years was as follows:

| Year | Field work M acres | Office compilation M acres |
|---|---|---|
| 1932 | 511 | - |
| 1933 | 955 | - |
| 1934 | 10,109 | 320 |
| 1935 | 7,478 | 4,479 |
| 1936 1/ | 637 | 2,239 |
| 1937 1/ | 3,430 | 5,439 |
| 1938 1/ | 2,160 | 4,799 |
| 1939 | 1,502 | 4,424 |
| 1940 | 2,711 | 4,175 |
| Total | 29,493 | 25,875 |

1/ In addition, most of the check cruising and stocking correlation field and office work was done during these years.

Two-inch-to-the-mile township type maps had been prepared on 27 million acres and one-inch-to-the-mile unit type maps on 26.1 million acres. Under a W.P.A. field project 1½ million acres of gross land area in Fergus County was mapped in 1940.

ACCOMPLISHMENTS DURING PAST YEAR: Field mapping and volume estimating was completed on 2,486,000 acres in Powell, Silver Bow, Deerlodge and Granite Counties in Montana. This completed the initial field work in the Inland Empire covering a total of 32 million acres of gross land area, 25.5 million acres of forest land. Office compilation work was completed on 3.7 million acres. Two-inch-to-the-mile township maps were drafted for 3.7 million acres and one-inch-to-the-mile unit maps were drafted for 1.6 million acres.

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After suspension from June to November, the W.P.A. project was resumed in November. During the year 5.1 million acres of forest and nonforest land in Eastern Montana was covered by field work under this project. Two-inch-to-the-mile maps were drafted for 1.8 million acres. These items supplement those above which refer entirely to the Inland Empire.

PLANS FOR 1942: Complete the office compilation work for the Inland Empire. Revise the inventory data for Benewah and possibly Kootenai Counties by field examination of areas cut over or burned since the initial field work (1932 to 1934) and make adjustments for growth, insect, and other depletion factors. Continue with sponsor contribution to W.P.A. forest inventory program for Eastern Montana.

DATE OF COMPLETION: Initial phase of the work should be completed in 1942. Revision of data is a continuing project.

ASSIGNMENT:

R. K. Winters
P. D. Kemp
W. L. Royer
O. B. Johnson
C. W. Brown
M. E. Metcalf
H. J. Pissot
J. B. LaCasse
R. L. Conn

January 1942

# GROWTH PHASE OF THE FOREST SURVEY

FIELD DIVISION: Forest Survey

WORK PROJECT: Forest Survey

LINE PROJECT: 2. Growth and Yield. Growth Phase of the Forest Survey in the Northern Rocky Mountain Region.

PURPOSE OF WORK: To determine the present annual board foot and cubic foot volume growth for important forest types, age classes, degrees of stocking, principal species, and other classifications, and to estimate potential annual growth.

REVIEW OF PAST WORK: Construction of larch-Douglas-fir normal yield table and a cubic foot volume table for western larch has been completed. Field studies were made to determine the stocking of average stands of the principal forest types in northeastern Washington, northern Idaho, and western Montana in relation to the stocking of normal stands of the same types. Correction factors applicable to normal yield table current growth figures to obtain growth for stands of varying degrees of understocking were worked out for the major forest types in northeastern Washington, northern Idaho, and western Montana. Completed current annual growth calculation for northeastern Washington and northern Idaho. Completed and published growth report for northern Idaho. Calculated current annual growth for Lincoln, Sanders, Mineral, and Ravalli Counties.

ACCOMPLISHMENTS DURING PAST YEAR: Calculated current annual growth by forest type, species, and ownership for Flathead and Lake Counties.

PLANS FOR 1942: Calculate current annual growth for remainder of the Inland Empire - Missoula, Powell, Lewis & Clark, Silver Bow, Deerlodge, and Granite Counties, Montana. Calculate potential growth of all western Montana counties. Calculate revised current and potential annual growth for Benewah and possibly Kootenai Counties, Idaho.

DATE OF COMPLETION: Initial growth calculations for the Inland Empire should be completed in 1942. Revision of growth estimates is a continuing project.

ASSIGNMENT: P. D. Kemp.

January 1942

# A STUDY OF FOREST DEPLETION FROM ALL CAUSES

FIELD DIVISION: Forest Survey

WORK PROJECT: Forest Survey

LINE PROJECT: 3. Depletion. A study of forest depletion from all causes in the Northern Rocky Mountain region.

PURPOSE OF WORK: To determine as part of the nationwide forest survey the average annual forest drain from cutting, fire, insects, and disease within the region.

REVIEW OF PAST WORK: Data on average annual cutting depletion for the period 1925-1934 or thereabouts were collected, compiled, and published for the entire region. Supplemental compilations of lumber depletion were made for the years 1935, 1936, 1937, and 1938. Data on average annual fire depletion for northern Idaho compiled and also for three counties in northeastern Washington, and for Lincoln and Sanders Counties, Montana. Determination of epidemic insect and disease depletion in northern Idaho completed. Collected post-inventory cutting and fire records for Montana counties and most of the post-inventory cutting records for northern Idaho.

ACCOMPLISHMENTS DURING PAST YEAR: Determined the average annual fire drain for the period 1931-37, inclusive, for Lincoln, Sanders, Mineral, Flathead, Ravalli, Lake, Lewis & Clark, and Missoula Counties, Montana.

PLANS FOR 1942: Determine average annual fire drain 1931-37 for Powell, Deerlodge, Silver Bow, and Granite Counties, Montana.

DATE OF COMPLETION: 1942.

ASSIGNMENT: R. K. Winters
P. D. Kemp
S. B. Hutchison
O. B. Johnson

January 1942

# STUDY OF PRESENT AND FUTURE REGIONAL REQUIREMENTS FOR FOREST PRODUCTS

FIELD DIVISION: Forest Survey

WORK PROJECT: Forest Survey

LINE PROJECT: 4. Requirements. A study of present and future regional requirements for forest products.

PURPOSE OF WORK: As part of the national forest survey to determine the current needs for forest products based on present consumption and the trends in use of such products and the underlying causes for such trends.

REVIEW OF PAST WORK: Collected basic data concerning requirements of timber products by railroads, remanufacturing industries, highway departments, public utilities, the mining industry, federal agencies, counties, states, and for farm and urban construction, including also the consumption of fuelwood and fence posts. Analysis of basic data completed and report published.

ACCOMPLISHMENTS DURING PAST YEAR: Project completed in 1940.

January 1942

# PERIODIC ADJUSTMENTS OF BASIC STATISTICS

FIELD DIVISION: Forest Survey

WORK PROJECT: Forest Survey

LINE PROJECT: 6. Keeping Findings Current. Periodic balance of timber books. Current information on forest situation.

PURPOSE OF WORK: To maintain current records of changes in forest inventory due to fire, logging, and other depletion, and to make periodic adjustments of inventory data.

REVIEW OF PAST WORK: Adjustments of northern Idaho inventory data were made on the basis of existing records and without field examination, for growth and drain, up to January 1, 1939. Field revisions of forest type maps and timber volumes were made for portions of Sanders, Flathead, and Lake Counties, Montana, that were mapped in 1934, 1935, and 1936, to make the field data for these counties current as of January 1, 1940.

ACCOMPLISHMENTS DURING PAST YEAR: A revision of pulpwood volumes in northern Idaho and northeastern Washington (based on office adjustments) to January 1, 1941, for the Pacific Pulp & Paper Journal.

PLANS FOR 1942: A reinventory by field examination of Benewah and possibly Kootenai Counties, Idaho.

DATE OF COMPLETION: A continuing project.

ASSIGNMENT: R. K. Winters and
Forest Survey staff.

January 1942

# METHODS OF ARTIFICIAL REVEGETATION

FIELD DIVISION: Range Research

WORK PROJECT: Artificial Revegetation

LINE PROJECT: Methods

PURPOSE OF WORK: Develop low cost methods for the artificial revegetation of depleted or formerly plowed range lands.

REVIEW OF PAST WORK: Plantings were made on more than 2,000 acres of abandoned croplands and depleted range lands since 1933 in 24 Montana counties and on 10 national forests, resulting in development of guides for species to reseed, season and depth for planting, and sowing methods. Manuscript prepared for Farmers' Bulletin on "Reseeding to Improve Montana Range Lands." Advice and guidance furnished CCC crews on national forest reseeding of logged, logged and burned, and severely overgrazed and depleted areas. Experiment established testing results of seedbed preparation on establishment of seeded species. Project analysis and work plans begun.

ACCOMPLISHMENTS DURING PAST YEAR: Manuscript for Farmers' Bulletin on reseeding revised and submitted for publication. Seedbed preparation tests showed better grass stands established on prepared soil where some weed competition removed than on unprepared soil with full weed competition. Tests for cheap method of reseeding in dense downy brome stands begun in the Bitterroot Valley. Tests for best method of planting blue grama started at Miles City. Preliminary results from CCC national forest plantings showed practicability of broadcast seedings on logged or burned areas and overgrazed, depleted mountain parks.

PLANS FOR 1942: Complete project analysis and work plans. Continue going experiments and records on plantings including tests for best methods of planting blue grama and for reseeding in dense downy brome types. Stress methods applicable to abandoned cropland.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Leon C. Hurtt, Gordon D. Merrick, and W. Luther Norem.

January 1942

# SITE FACTORS IN ARTIFICIAL REVEGETATION

FIELD DIVISION: Range Research

WORK PROJECT: Artificial Revegetation

LINE PROJECT: Site Factors

PURPOSE OF WORK: Determine effect of edaphic, biotic, climatic, physiographic, or other site factors on artificial revegetation.

REVIEW OF PAST WORK: Guides set up for density of native vegetation which marks competition too great for successful reseeding to crested wheatgrass. This species is adapted to many sites from 2,300 to 8,600 feet elevation. Partial shade reduced soil temperatures and proved to be important factor in seedling survival. Weed competition found to reduce seedling survival more in spring than in fall plantings. In dense, native bunchgrasses, reseeding success was directly proportional to the amount of competition destroyed by soil cultivation. Several species were planted on land abandoned 1 to 5 years to test survival in plant associations present. Site selected at 9,300 feet elevation for testing effects of high altitude.

ACCOMPLISHMENTS DURING PAST YEAR: Establishment reseeded species found good on land abandoned from cultivation one year with Russian thistle type, uncertain on land abandoned three years with dense weeds, sweetclover, and Japanese chess, poor in very dense Japanese chess on land abandoned five years. Five promising species, Agropyron cristatum, A. inerme, and A. intermedium, Bromus erectus, and Elymus junceus, planted in replicated tests of three soil types at Miles City. In the Bitterroot Valley, a study of effects of competition of dense downy brome on establishment of seedlings begun.

PLANS FOR 1942; Continue studies of effects of competition on establishment of seedlings on logged and burned land on Bitterroot and on abandoned croplands. Plant high altitude test nursery. Delimit zones of similar site conditions from existing records.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Leon C. Hurtt, Gordon D. Merrick, and W. Luther Norem.

January 1942

# SPECIES AND MIXTURES FOR ARTIFICIAL RANGE REVEGETATION

FIELD DIVISION: Range Research

WORK PROJECT: Artificial Revegetation

LINE PROJECT: Species Adaptability

PURPOSE OF WORK: Test adaptability of certain species and mixtures for revegetation and test grazing value of promising ones.

REVIEW OF PAST WORK: Wide adaptability of crested wheatgrass and more limited or low reseeding value of others shown by plantings made past 8 years. Adaptation nurseries were established near Miles City, Missoula, Vigilante, and Thompson Falls, with 36 to 107 accessions planted at each. Species appearing promising from nursery trials selected and planted on range adaptation areas, 18 species and 5 mixtures near Lewistown, 13 species and 5 mixtures near Miles City. A third range adaptation area has been selected near Stevensville. Comparative grazing value tests of crested wheatgrass and native range were begun at Miles City. Ten species were planted in 1940 on overgrazed range and 5 species were broadcast on a steep eroding hillside at 7,600 feet elevation on the Beaverhead N.F. Logged and burned Bitterroot N.F. areas reseeded in 1940 by cheap methods with 8 species in spring plantings and 10 species in fall plantings gave substantial stand of most species on heavily burned spots but not where competition was severe.

ACCOMPLISHMENTS DURING PAST YEAR: Bitterroot range adaptation area near Stevensville planted with 20 species and 5 mixtures. Additional species and strains planted in nurseries. Uniform grass nursery tests begun on four species at Miles City and one species at Vigilante. Observations made on range adaptation areas showing several species probably suited for more extensive plantings. Bitterroot forest range plantings showed five especially promising species. Three other species are fairly promising.

Yearling steers and heifers on crested wheatgrass pasture gained an average of 2.01 pounds per day from May 1 to August 7 as compared to 1.93 pounds per day on nearby native range. The grass was not grazed during its dormant period after August 7. Fall growth was succulent and watery and weight gains averaged only 0.7 pound per day for 28 days of September and October.

PLANS FOR 1942: Establish additional range adaptation areas for testing of promising species. Plant best species from nurseries in range adaptation areas. Plant high altitude nursery at Vigilante.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Leon C. Hurtt, Gordon D. Merrick, and W. Luther Norem.

January 1942

# MANAGEMENT SUMMER RANGES

FIELD DIVISION: Range Research

WORK PROJECT: Grazing Management

LINE PROJECT: Management Summer Ranges

PURPOSE OF WORK: To determine best management and utilization practices for summer cattle and sheep ranges, vegetation and economics of livestock production both considered.

REVIEW OF PAST WORK: Research for summer ranges on a limited basis due to restricted funds. Studies have been initiated to develop guides to grazing capacity and season of use for cattle range. Since 1938 an annual utilization survey has been conducted, based on measurements of about 4,500 plants for certain key species, grazed and ungrazed, and use of R-1 Forage Volume Tables. The weight of forage produced by key species as affected by clipping at various heights and intervals of time has been investigated since 1938.

In 1938 a plant development study was established at four elevations on grazed and ungrazed ranges. Preliminary data indicate that grazing season may open before June 1 in some years. Quadrats were established in 1939 to study density changes on grazed and ungrazed sites at two different opening dates, but trends not clearly defined in 1940.

ACCOMPLISHMENTS DURING PAST YEAR: Plots that were clipped three times during each of three successive years produced less grass the second and third than the first year, but the yield of those clipped only once had not changed materially through the three years. Clipping data for 1941 not yet analyzed. Plant development data for the years 1938, 1939, and 1940 show that 90 percent or more of the culm-producing Festuca and Poa plants up to about 7,000 feet elevation had reached the boot stage by May 25 or about a week earlier than the June 1 opening date. The utilization survey method was further simplified by limiting measurements to two key species instead of three.

PLANS FOR 1942: Continue clipping, density, and plant development studies. Improve the technique for measuring range utilization.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Leon C. Hurtt and Grant Harris or Paul Lemon.

January 1942

# MANAGEMENT SHORT-GRASS RANGES

FIELD DIVISION: Range Research

WORK PROJECT: Grazing Management

LINE PROJECT: Management Short-grass Ranges - Sheep Phase

PURPOSE OF WORK: To determine the best range utilization and management practices for sheep, welfare of the range and economics of sheep production both considered.

REVIEW OF PAST WORK: Number of yearling ewes in each of a series of pastures grazed at different intensities has been increased from 42 to 104 since 1937 to keep pace with vegetation recovering from drought. Response of sheep and vegetation to weather and grazing has been studied by observing weight gains and habits of sheep and density, composition, height, and utilization of vegetation. Average sheep gains over 5 years are significantly less at the 5 percent level under heavy grazing than under moderate grazing and at the 1 percent level, for the light grazing intensity. Recovery of vegetation from drought on sheep pastures about the same as on cattle pastures except that grama grass has declined under heavy sheep grazing and is being replaced by sand dropseed and annual weeds.

ACCOMPLISHMENTS DURING PAST YEAR: According to a survey of range conditions made in 1941, 73 percent of heavily grazed pasture J, 42 percent of moderately grazed pasture K, and 21 percent of lightly grazed pasture L has been definitely damaged. Damage consisted of reduced vegetal density, soil removal, or both on areas of concentrated grazing. Continued heavy stocking has seriously depleted grama grass range and permitted establishment of dense stands of Sporobolus cryptandrus.

Average gains per ewe for 1941 season differ less than 1 pound between lots and are not significant. Only three pastures were stocked in 1941.

PLANS FOR 1942: Study response of vegetation to weather and accumulated grazing use particularly as reflected by vigor and development and crop production. Analyze data and start preparation of a publication.

DATE OF COMPLETION: In 1943 for field work.

ASSIGNMENTS: E. J. Woolfolk, Leon C. Hurtt, Clark E. Holscher, and assistants, in cooperation with the Bureau of Animal Industry and the Montana Agricultural Experiment Station at the U. S. Range Livestock Experiment Station.

January 1942

# MANAGEMENT SHORT-GRASS RANGES

FIELD DIVISION: Range Research

WORK PROJECT: Grazing Management

LINE PROJECT: Management Short-grass Ranges - Cattle Phase

PURPOSE OF WORK: To determine the best range utilization and management practices for cattle, welfare of the range and economics of cattle production both considered.

REVIEW OF PAST WORK: Since 1933, eight crops of calves have been produced in heavy, moderate, and lightly grazed pastures aggregating 39,873, 48,342, and 47,035 pounds, respectively, at weaning. Calf crops have averaged 77.5, 84.4, and 81.9 percent for the 20 cows of each lot for the period with a yearly average of 249, 302, and 294 pounds of weaning weight per cow. Average costs of feed (range plus hay) equal 3.8, 2.7, and 2.9 cents per pound of calf weaned, or $12.30, $9.52, and $10.44 per head of weaned calf in the heavy, moderate, and lightly grazed lots, respectively. Moderate grazing gives best returns during drought as well as in normal years.

Density of all vegetation depleted by drought prior to 1937 has increased quite uniformly through early 1941 on quadrats for all three grazing intensities. Sandberg bluegrass and annual weeds which were abundant during the dry period have declined in recent years while more valuable perennial grasses have increased. Pricklypear has increased at a very rapid rate since drought.

ACCOMPLISHMENTS DURING PAST YEAR: Calves weaned from heavy, moderate, and lightly grazed pastures in 1941 were the heaviest in 8 years, averaging 407.5, 453.9, and 461.6 pounds, respectively. Calf crops for the three lots were 95, 80, and 90 percent; the largest to date under heavy use, below average for moderate use, and largest except one for light use. The breeding period was limited to 6 weeks and six bulls were used instead of one bull for six pastures, used two years with unsatisfactory results.

Total density of vegetation continued to increase but at a reduced rate as compared to the previous year. By early 1941, charted quadrats showed a 14 percent increase over the early 1940 density level, but this was only 66 percent of the pre-drought level of 1933. Height growth was above normal in 1941 and also exceeded the 1940 level due to very favorable precipitation. Summer pastures carried the 20 cows of each lot in satisfactory condition for the full 6-month period without supplemental feed.

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PLANS FOR 1942: Continue study of response of range vegetation and cattle to weather and three grazing intensities. Hasten analysis of data for all phases of project.

DATE OF COMPLETION: 1946.

ASSIGNMENT: Leon C. Hurtt, E. J. Woolfolk, and Clark E. Holscher, in cooperation with Bureau of Animal Industry and the Montana Agricultural Experiment Station at the U. S. Range Livestock Experiment Station.

January 1942

# RANGE UTILIZATION STANDARDS

FIELD DIVISION: Range Research

WORK PROJECT: Grazing Management

LINE PROJECT: Management Short-grass Ranges, Utilization Standards

PURPOSE OF WORK: To develop practicable methods and standards for measuring degree of utilization on experimental short-grass ranges.

REVIEW OF PAST WORK: Clipping of paired plots, protected and grazed, tested as a means of estimating forage utilization proved unsatisfactory. A method was developed for detailed research work involving random measurements of stubbles, estimates of percents of plants grazed, and the use of height-weight curves and tables for key forage species. Improvements have been made in pasture sampling by the grid method, in methods of plant observation and the use of height-weight curves. This method is not suited for administrative use without adaptation. Efforts to supplement key species with additional species not entirely satisfactory. Bluestem wheatgrass, blue grama, and niggerwool sedge are considered as key species. Bluestem wheatgrass promises to be best indicator of general forage use in experimental cattle pastures. Utilization classes developed to apply to chart and density list quadrats. Some correlation between stubble heights and calf gains is in evidence.

ACCOMPLISHMENTS DURING PAST YEAR: Utilization surveys were repeated on the summer and winter cattle pastures and on the sheep pastures near the end of the various grazing periods. After analyses of previous data, the sampling intensity on the summer cattle pastures was reduced and field and office procedures shortened and simplified by broadening the subtype classification. Plants of bluestem wheatgrass and blue grama collected and segmented for additional height-weight data to test for differences due to sites, height of plants, years, and grazing intensities. Data not yet analyzed.

PLANS FOR 1942: Continue the utilization work on the cattle pastures as a part of the short-grass range management project with emphasis on (1) speeding up and simplifying the method now in use, (2) furthering study on height-weight relationships as influenced by years, site, height of plants, and grazing treatment, (3) striving to test correlation of utilization with calf gains and weights, and (4) attempting to base utilization standards on amount of forage remaining rather than amount removed.

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DATE OF COMPLETION: This work has largely passed the developmental stage. The surveys will be made yearly as heretofore and better procedures will be adopted from time to time. Hereafter this work will be considered as a part of the sheep and cattle management phases rather than carried as a separate line project.

ASSIGNMENT: Combined with sheep and cattle phases of short-grass range management project.

January 1942

# RESEARCH METHODS IN RANGE PLANT ECOLOGY

FIELD DIVISION: Range Research

WORK PROJECT: Grazing Management

LINE PROJECT: Evaluate existing and devise better methods and procedures for measuring response of range vegetation to habitat factors and various treatments.

REVIEW OF PAST WORK: Changes in range vegetation that occur in many experiments cannot be satisfactorily measured or evaluated by existing methods. Efforts have been made to develop and test better methods at the U.S.Range Livestock Experiment Station, but these have been done largely as incidental to project work. The "decimeter-frame" estimate method and a "plot transector" have been developed and used. A substantial saving in time has resulted from use of the former. Other changes and improvements in methods have resulted from efforts along this line but our resources are not adequate for systematic work to improve research methods on a project basis.

ACCOMPLISHMENTS DURING PAST YEAR: No new device or method developed during the year, but various improved procedures initiated in connection with various phases of the management project.

PLANS FOR 1942: Discontinue as a separate line project but continue efforts to improve procedures as a definite but incidental part of other management project work. Because of potential savings in time and expense through better methods, the study should be renewed on a project basis at the appropriate time.

ASSIGNMENT: None.